U. S. AIR FORCE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

JOINT BASE CHARLESTON,

SOUTH CAROLINA

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan is based on the United States Air Force's (USAF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which includes Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Where applicable, external resources, including Air Force Instructions (AFIs); Department of Defense Instructions (DoDIs); USAF Playbooks; federal, state, and local requirements; Biological Opinions; and permits are referenced.

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language that address USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the USAF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by the approved plan owner.

NOTE: The terms "Natural Resources Manager," "NRM," and "NRM/POC" are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in DoDI 4715.03, Natural Resources Conservation Program.

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DOCUMENT CONTROL

Standardized INRMP Template

In accordance with (IAW) the Air Force Civil Engineer Center (AFCEC) Environmental Directorate (CZ) Business Rule (BR) 08, *EMP Review, Update, and Maintenance*, the standard content in this INRMP template is reviewed periodically, updated as appropriate, and approved by the by the Natural Resources Subject Matter Expert (SME).

This version of the template is current as of 10/03/2018 and supersedes the 2015 version.

NOTE: Installations are not required to update their INRMPs every time this template is updated. When it is time for installations to update their INRMPs, they should refer to the eDASH EMP Repository to ensure they have the most current version.

Installation INRMP

Record of Review – The INRMP is updated no less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. IAW the Sikes Act and AFI 32-7064, *Integrated Natural Resources Management*, the INRMP is required to be reviewed for operation and effect no less than every five years. An INRMP is considered compliant with the Sikes Act if it has been approved in writing by the appropriate representative from each cooperating agency within the past five years. Approval of a new or revised INRMP is documented by signature on a signature page signed by the Installation Commander (or designee), and a designated representative of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries when applicable (AFI 32-7064).

Annual reviews and updates are accomplished by the installation Natural Resources Manager (NRM), and/or a Section Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the Section Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of USFWS, state fish and wildlife agency, and NOAA Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signing the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

APPROVAL AND AGENCY CONCURRENCE

This Integrated Management Plan (INRMP) has been prepared in accordance with regulations, standards, and procedures of the Department of Defense and the U.S. Air Force in cooperation with the U.S. Fish and Wildlife Service and S. C. Department of Natural Resources. The signatures below indicate the mutual agreement of the parties concerning the conservation, protection and management of fish and wildlife resources in the INRMP.

_____

Marc Greene, Colonel, USAF
Commander, Joint Base Charleston

_____

Date

_____	_____
Thomas McCoy, Field Supervisor U.S. Fish and Wildlife Service	Robert H. Boyles, Jr., Director S. C. Department of Natural Resources
_____	_____
Date	Date

EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) was developed to provide interdisciplinary strategic guidance for natural resources management on Joint Base Charleston (JB CHS) for a period of five years. The INRMP is a dynamic document that contains information pertinent to every office or agency assigned to JB CHS. The INRMP is integrated with other planning functions, including general planning, cultural resources management planning, Bird/Wildlife Aircraft Strike Hazard (BASH) planning, and pest management planning. Natural resources (NR) management, as a result of implementation of this INRMP, will support the military mission. NR managers will implement the principles of multiple use and sustained yield using scientific methods and an interdisciplinary approach. The management approach to specific resources is detailed in Chapter 7. The conservation of natural resources and the military mission shall not be mutually exclusive. Management of natural resources at JB CHS will result in no net loss of the military mission and operational capability.

Natural resource categories addressed for program management in this INRMP include: geographic information systems (GIS), fish and wildlife management, threatened and endangered (T&E) species management, integrated pest management, wetland and water resource protection, grounds maintenance, forest management, wildland fire management, BASH, outdoor recreation, public access to natural resources, conservation law enforcement, coastal zone and marine resources management, cultural resources protection and public outreach. These resource categories are further detailed below:

Geographic InformationSystems Management

- Enhance, update, and maintain GIS data; and
- Use GIS information as a tool for developing future natural resource management goals and objectives.

Fish and Wildlife Management

- Preserve, protect, and manage wildlife habitats to ensure healthy, productive wildlife populations using an ecosystem-based management approach; and
- Maintain partnerships and coordination with agencies and groups involved in fish and wildlife management.

Threatened and Endangered Species Management

- Manage and protect rare, T&E species and their habitats.

Nuisance and Invasive Species Management

- Identify and control invasive plant species; and
- Assist the Entomology/Pest Management Office with nuisance wildlife.

Wetlands and Waters of the U.S. Management

- Conserve and protect wetlands and their natural functions; and
- Protect wetlands from operational activities at JB CHS and maintain healthy, functional wetlands.

Grounds Maintenance and Land Management

- Implement beneficial landscaping and grounds maintenance practices to reduce erosion and improve wildlife habitat; and
- Make maximum use of regionally native plant species and avoid introductions of invasive and non-native species in re-vegetation and landscaping activities.

Forest Management

- Continue development and management of "urban forest" trees on Base; and
- Protect and manage woodlands on the installation.

Wildland Fire Management

- Provide for the safety of installation personnel, the public and wildland fire personnel; and for the protection of Base infrastructure and real property;
- Achieve the JB CHS's INRMP resource management goals and objectives that are dependent on use of prescribed fire;
- Minimize wildfire threat; and
- Generate support for wildland fire management and more specifically prescribed fire at JB CHS.

Bird/Wildlife Aircraft Strike Hazard Management

- Minimize aircraft exposure to potential wildlife strike hazards.

Outdoor Recreation Management

- Improve the quality of life at JB CHS and surrounding communities by providing facilities and information that encourage natural resource based outdoor recreation and education on JB CHS;
- Provide recreational hunting opportunity to military and civilian community; and
- Comply with installation policies and procedures as well as state and federal fish and wildlife laws and regulations.

Cultural Resources Protection

- Protect National Register of Historic Places (NRHP)-eligible cultural resources from natural resource activities impacts.

Public Outreach

- Promote natural resource education and awareness, and beneficial relations with surrounding communities via natural resource based activities and events.

These goals were developed from a comprehensive analysis of regulatory requirements, the condition of natural resources on JB CHS, and a consideration of the value of these resources to the people who live and work on and around the installations. Chapter 8 identifies the specific objectives and associated projects for each goal, and Chapter 10 provides the work plans necessary for implementation of these objectives.

Species Management

The natural resource actions described in this INRMP are for the benefit of the plants, animals, and ecosystems that occur or potentially occur on JB CHS. Special attention is given to the threatened and endangered species and species of concern referenced in Table ES-1. These actions include 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 sturgeon, manatee, shorebirds, and fish. Forestry actions such as prescribed burning and thinning help to establish longleaf pine stands and herbaceous low-lying vegetation that benefit species that utilize those habitats.

Table ES-1. Federal and State Listed Threatened, Endangered or At Risk Species that occur or potentially occur on Joint Base Charleston

Species		Status		Installation
Common Name	**Scientific Name**	**Federal**	**State**	
Reptiles & Amphibians:				
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	T	E	W
American Alligator	*Alligator mississippiensis*	T*	T*	A, W
Dwarf Siren	*Pseudobranchus striatus*		T	W
Birds:				
Wood Stork	*Mycteria americana*	T	E	A, W
Bald Eagle	*Haliaeetus leucocephalus*		T	A, W, NAAF
Swallow-Tailed Kite	*Elanoides forficatus*	SC	E	W, NAAF
Red-Cockaded Woodpecker	*Picoides borealis*	E	E	W, NAAF
Least Tern	*Sterna antillarum*		T	A, W
Wilson's Plover	*Charadrius wilsonia*		T	W
Painted Bunting	*Passerina ciris*	SC		A, W, NAAF
Loggerhead Shrike	*Lanius ludovicianus*	SC		A, W, NAAF
Mammals:				
West Indian Manatee	*Trichechus manatus*	T		W
Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	SC	E	W
Southeastern Myotis	*Myotis austroriparius*	SC		W

Species		Status		Installation
Common Name	**Scientific Name**	**Federal**	**State**	
Fish:				
Atlantic sturgeon	*Acipenser ozyrinchus*	E		W
Shortnose Sturgeon	*Acipenser brevirostrum*	E	E	W
Plants:				
Canby's Dropwort	*Oxypolis canby*	E		W
Pondberry	*Lindera melissifolia*	E		W
American Chaff-Seed	*Schwalbea americana*	E		W
Carolina birds-in-a-nest	*Macbridea caroliniana*	AR		NAAF

AR = At Risk
SC = Species of Concern
T = Threatened
E = Endangered
T* = Threatened by similarity of appearance
Federal = Federally listed under the U.S. Endangered Species Act
State = State listed by South Carolina Department of Natural Resources
A = JB CHS Air
W = JB CHS Weapons
NAAF = North Auxiliary Airfield

This INRMP meets the requirements of Public Law 105-85, the Sikes Act Improvement Act (SAIA) of 1997 (16 U.S.C. 670 *et seq*.), as amended. This INRMP does not represent a significant change in management direction for JB CHS.

1.0 OVERVIEW AND SCOPE

This INRMP was developed to provide for effective management and protection of natural resources. It summarizes the natural resources present on the installation and outlines strategies to adequately manage those resources. Natural resources are valuable assets of the USAF. They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF adaptability in all environments. The USAF has stewardship responsibility for the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the USAF natural resources program is to sustain, restore, and modernize natural infrastructure to ensure operational capability and no net loss in the capability of USAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

1.1 Purpose and Scope

The purpose of this INRMP is to provide guidance for the proper management of natural resources on JB CHS while ensuring that the military mission requirements are met.

JB CHS includes lands encompassed by JB CHS Air (formerly Charleston Air Force Base [AFB]) in Charleston County and lands encompassed by JB CHS Weapons (formerly Naval Weapons Station Charleston) in Charleston and Berkeley Counties. JB CHS Air also includes North Auxiliary Airfield (NAAF) in Orangeburg County. The JB CHS INRMP also considers the surrounding natural resources through implementation of an integrated approach to management. The addition of any lands in the future will require a revision or addendum to this INRMP.

The JB CHS INRMP covers a five-year period, but is intended to serve as a "living" document with the flexibility to accommodate changes in the ecosystem and military mission. Annual updates to the management program and review and revision at five-year intervals will ensure that the INRMP integrates the latest scientific knowledge and evolves to meet the future requirements of the military mission and natural resources while maintaining consistency with federal mandates for land stewardship

The JB CHS INRMP includes provisions for:

- the conservation and rehabilitation of natural resources at the installation;
- the sustainable multipurpose use of resources including hunting, fishing, trapping, and non-consumptive uses; and
- public access to the installation within safety and military security requirements.

1.2 Management Philosophy

The guiding principle behind the development of the JB CHS INRMP is sound ecosystem management through interdisciplinary coordination for the protection of biological diversity. The comprehensive goal of ecosystem management on JB CHS is to maintain and improve the sustainability and biological diversity of native ecosystems while supporting the Air Force mission and the needs of the military community. Managing ecosystems involves addressing the environment as a complex system of interrelated components rather than a collection of isolated units. Military operations and compliance with federal, state, and local requirements are essential components of the JB CHS mission. Successful ecosystem management requires Air Force environmental managers to consider the military mission, state

and federal laws, community values, socioeconomics, and adjacent land uses in addition to the biological environment. Management of natural resources on JB CHS lands will result in no net loss of the military mission or operational capability.

1.3 Authority

The INRMP serves as a key component of the Installation Development Plan, which provides background and rationale for the policies and programming decisions related to land use, resource conservation, facilities and infrastructure development, and operations and maintenance to ensure that they meet current requirements and provide for future growth. The INRMP supports the mission by identifying the natural resources present on the installation, developing management goals for these resources, and integrating these management objectives into the military requirements for mission operations/support and regulatory compliance to minimize natural resource constraints.

This INRMP outlines the steps needed to fulfill compliance requirements related to natural resources management and fosters environmental stewardship. It is organized into the following principal sections:

- An overview of the current status and potential future conditions of the natural resources;
- Identification of potential impacts to or from natural resources;
- The key natural resource management areas addressed;
- Management recommendations that incorporate the installation's goals and objectives for natural resource management areas; and,
- Specific work plans for effective implementation of the INRMP.

Management issues and concerns, as well as goals and objectives, are developed from analysis of all the gathered information, and are reviewed by JB CHS personnel involved with or responsible for various aspects of natural resources management. The INRMP was developed using an interdisciplinary approach and is based on existing information of the physical and biotic environments, mission activities, and environmental management practices at JB CHS. Information was obtained from a variety of documents, interviews with installation personnel, on-site observations, and communications with both internal and external stakeholders. Coordination and correspondence with these agencies is documented and satisfies a portion of the requirements of 32 Code of Federal Regulations (CFR) 989, *Environmental Impact Analysis Process (EIAP)*.

Goals and objectives require monitoring on a continuous basis and management strategies are updated whenever there are changes in mission requirements, adverse effects to or from natural resources, or changes in regulations governing management of natural resources. The NR managers at JB CHS will continue to implement adaptive management of resources. Adaptive management is a strategy used in conservation planning whereby goals for the plan are set, information is collected to evaluate whether the goals are being met, and management is adjusted if necessary to ensure success in achieving the goals.

Mutual agreement with the U.S. Fish and Wildlife Service (USFWS) and South Carolina Department of Natural Resources (SCDNR) is the goal with respect to the entire INRMP. However, mutual agreement is required only with respect to those elements of the plan that are subject to the otherwise applicable legal authority of USFWS and SCDNR to conserve, protect, and manage fish and wildlife resources. No element of the SAIA is intended to either enlarge or diminish the existing responsibility and authority of USFWS or SCDNR concerning natural resources management on military lands. If the USFWS or SCDNR withheld agreement with the INRMP based on objections to elements of the INRMP clearly not within the scope of the particular agency's authority, JB CHS could, notwithstanding the objections, finalize the INRMP and proceed to manage its natural resources in accordanc with the terms of the plan.

1.4 Integration with Other Plans

The INRMP is a tool for managers in the planning, development, and implementation of a program tailored to the requirements of specific facilities and land holdings. The JB CHS INRMP will incorporate or coordinated with the Base General Plan, the Integrated Pest Management Plan (IPMP), the BASH Plan, the Air Installation Compatible Use Zone (AICUZ), the Integrated Cultural Resources Management Plan (ICRMP), the Migratory Bird Management Plan (MBMP), the Hunting and Fishing Program Plan, the T&E Species Management Plan, the Wildland Fire Management Plan (WFMP), the Golf Course Environmental Management (GEM) Plan, the Invasive Species Survey and Management Plan – JB Air, the Tree Ordinance, and other pertinent planning documents to ensure that mission activities are conducted in agreement with sound ecosystem management for the protection of biological diversity.

These plans adhere to federal and state regulatory requirements and will be utilized as tools for implementing this plan. These plans are dynamic, updated periodically, and will be inclusive of the goals and objectives identified in this INRMP.

This INRMP is identified as a component plan of the Installation Development Plan (Zapata, 2010) as required by AFI 32-7062, *Comprehensive Planning* (October 1997, certified current November 2009). The INRMP is used to assist plan preparers in preparing the composite constraints and opportunities plan component which details all available information about natural and man-made environmental features that may limit development of JB CHS.

AFI 32-7064, *Integrated Natural Resources Management* (September 2004), requires that installations ensure that the INRMPs, BASH Plan, IPMP, ICRMP and other relevant plans and studies are mutually supportive and not in conflict.

The NR manager will ensure that the INRMP is mutually supportive of the JB CHS BASH Reduction Plan (JBCI 91-2121, August 2010) by coordinating draft INRMPs and updates with airfield operations and flight safety personnel to ensure conformance with airfield safety criteria. Additionally, the NR manager will assist the installation flight safety office and others in the development and implementation of the BASH Plan, and assign NR personnel to be active members of the installation Bird/Wildlife Hazard Working Group (BHWG).

In accordance with AFI 32-1053, *Pest Management Program* (June 2009), the installation IPMP must address all strategies for managing pests. NR managers coordinate with pest management personnel to ensure that the IPMP and INRMP are mutually supportive and not in conflict. Installation pest management personnel have primary responsibility for the control of nuisance wildlife species, although the program can receive substantial support from NR management personnel. The installation IPMP designates the responsibilities for pest management personnel and NR personnel regarding control of nuisance wildlife.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	JB CHS is an Air Mobility Command facility home to the 628th Air BaseWing (ABW). The ABW has responsibility for implementing the natural resources program and for compliance with applicable state and federal regulations.
Natural Resources Manager	Name: Terrence Larimer Phone: 843-794-7951 Email: terrence.larimer@us.af.mil
State and/or local regulatory POCs	South Carolina Department of Natural Resources
Total acres managed by Installation	Total 23,114 - AB: 3,772; NAAF: 2,392: WS: 16,950 acres
Total acreage of wetlands	354
Total acreage of forested land	792
Does installation have any Biological Opinions	No
Natural Resources Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)	☒ Fish and Wildlife Management ☒ Outdoor Recreation and Access to Natural Resources ☒ Conservation Law Enforcement ☒ Management of Threatened and Endangered Species ☒ Water Resource Protection ☒ Wetland Protection ☒ Grounds Maintenance ☒ Forest Management ☒ Wildland Fire Management ☐ Agricultural Outleasing ☒ Integrated Pest Management Program ☒ Bird/Wildlife Aircraft Strike Hazard (BASH) ☒ Coastal Zone and Marine Resources Management ☒ Cultural Resources Protection ☒ Public Outreach ☒ Geographic Information Systems (GIS)

2.1 Installation Overview

2.1.1 Location and Area

JB CHS is an Air Mobility Command facility and is home to the 628th Air Base Wing (ABW). The 628th ABW is the host unit at JB CHS and together with the 315th Air Force Associate Reserve Airlift Wing (AW) provides a large part of the Air Mobility Command's Global Reach airlift capabilities. JB CHS Air Base encompasses 3,733 acres in Charleston County, South Carolina, 2,392 acres at the NAAF in Orangeburg County, South Carolina, and 16,950 acres at the Weapons Station in Berkeley and Charleston Counties, South Carolina. Figure 2-1 is a vicinity map showing the three facility locations that constitute the base: Air Base, NAAF, and Weapons Station. These locations are summarized below.

JB CHS Air Base

JB CHS Air Base situated in the coastal zone of South Carolina at 32°53'55" North latitude and 80°02'26" West longitude between the Ashley and Cooper Rivers approximately 10 miles northwest of the City of Charleston and within the incorporated boundaries of North Charleston (Figure 2-2). Approximately 15 percent of the installation is open area and relatively undeveloped. Land use is dominated by two runway areas consisting of a 9,001 × 200 foot concrete runway and a 7,004 × 150 foot asphalt runway, and there are 1,010 buildings, totaling 4,873,962 square feet (Figure 2-2). Major traffic thoroughfares near JB CHS Air include Ashley Phosphate Road to the north; Interstate 26 to the east; Interstate 526 (the Mark Clark Expressway) to the south; and Dorchester Road to the west (Figure 2-2). The northern and eastern portion of JB CHS Air is primarily flat and consists of paved areas (primarily taxiways and runways) interspersed with turf areas. The flight control tower and other associated buildings are located in this portion of the Base. Industrial facilities are found in the central area, adjacent to the flightline area. Topography in this area is primarily level and includes small grassy areas between buildings and roads.

The southern and western portions of JB CHS Air contain Base housing, community services facilities, recreational areas, and the Base golf course. There is also a recreational vehicle camping area located in this portion of JB CHS Air, which is primarily grassy or wooded. The primary mission of the installation is to command assigned airlift and supporting units and to provide for airlift of troops and passengers, military equipment and supplies when required. Other mission requirements range from supporting U.S. embassies to supplying humanitarian airlift relief to victims of disasters.

JB CHS North Auxiliary Airfield

JB CHS NAAF is a 2,392 acre remote military airfield in Orangeburg County, South Carolina, located approximately three miles east of the town of North, South Carolina (33° 36.2' North latitude, 81° 04.7' West longitude; Figure 2-3). The NAAF is operated by the 628th Mission Support Group, Civil Engineer Squadron. The NAAF is used primarily for practice landings and takeoffs by the Airlift Wings based at JB CHS Air. The NAAF provides a remote training field and also serves as an alternate landing site for emergency situations.

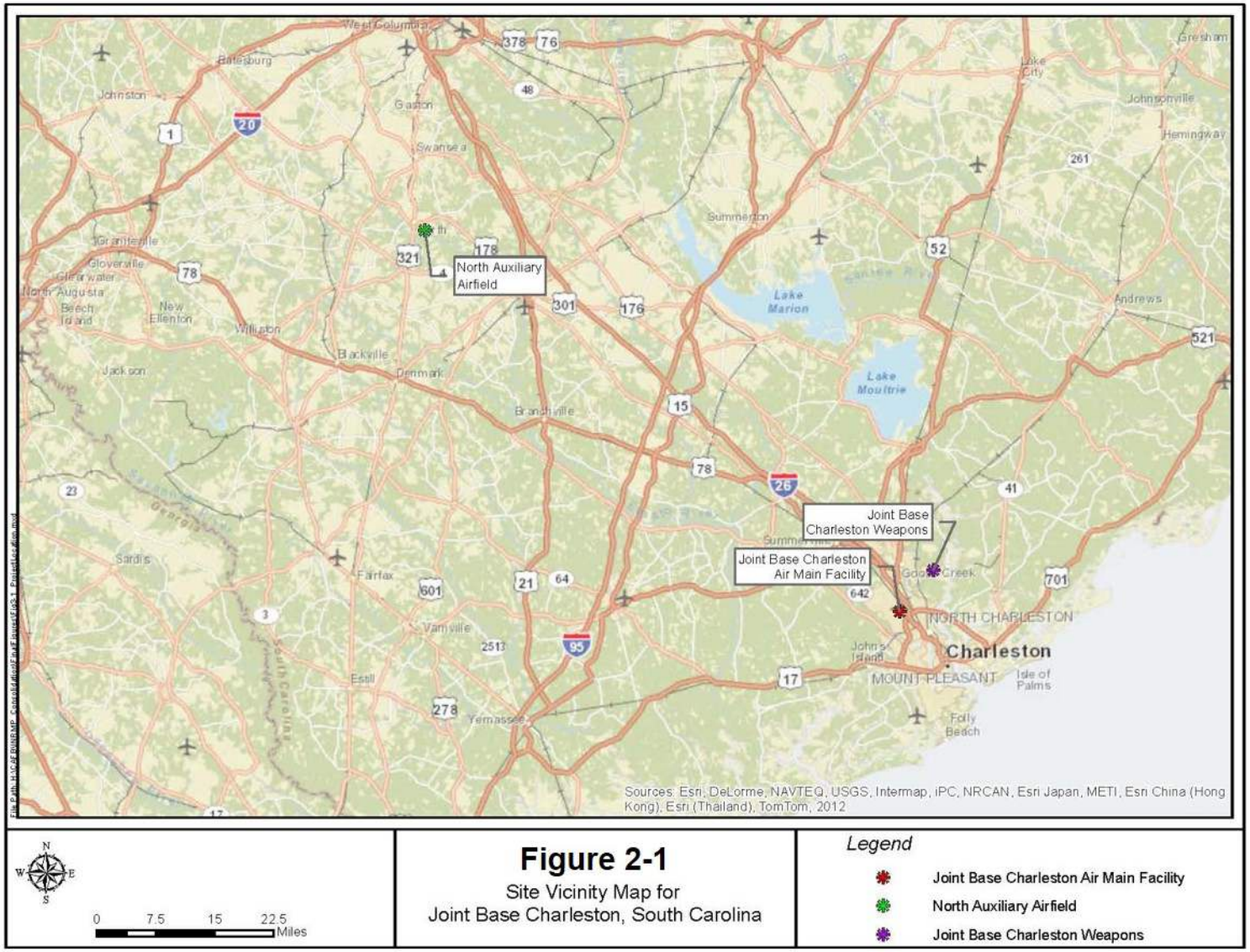

Figure 2-1. Site vicinity map for Joint Base Charleston, South Carolina

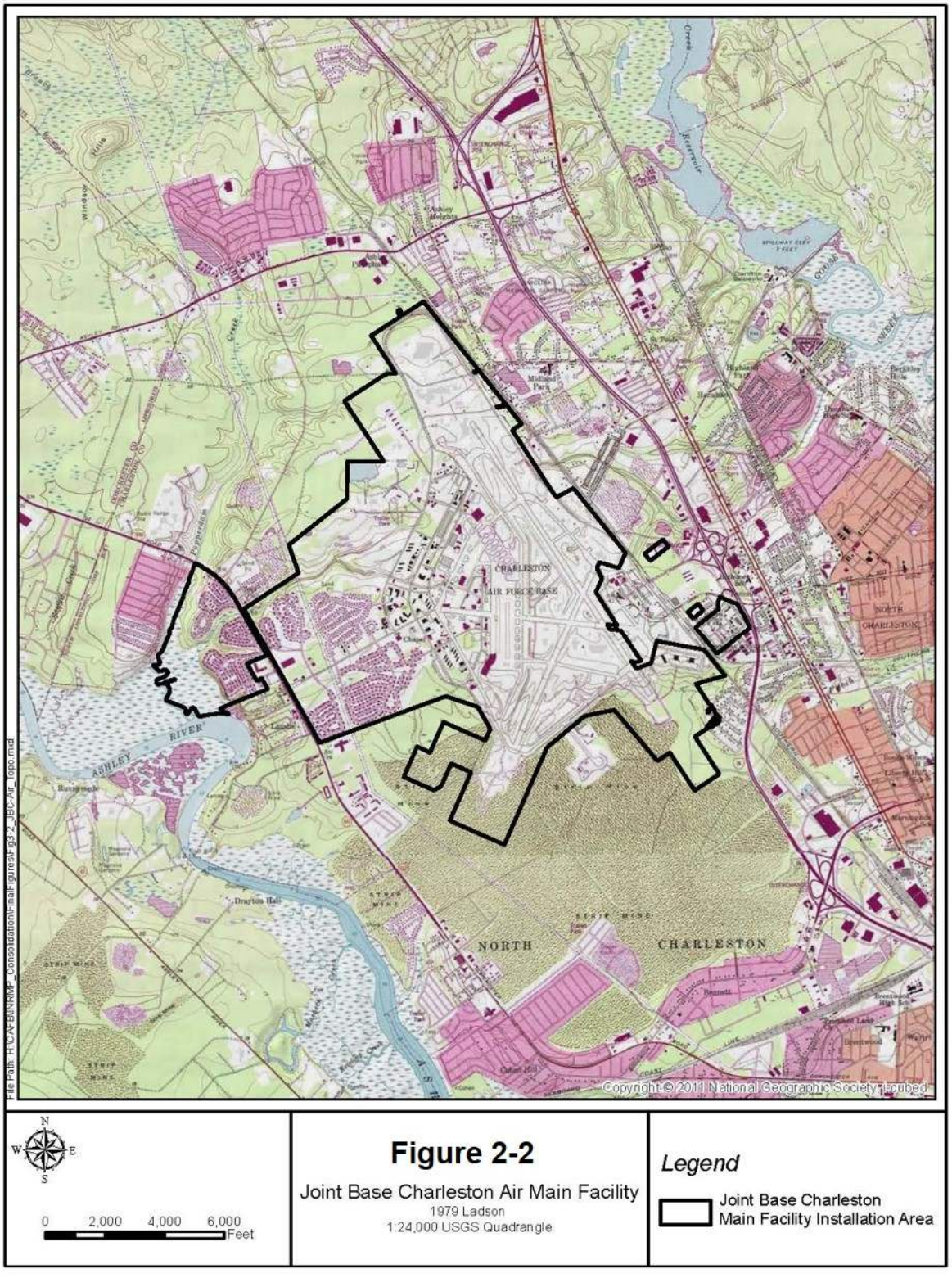

Figure 2-2. JB CHS Air Base

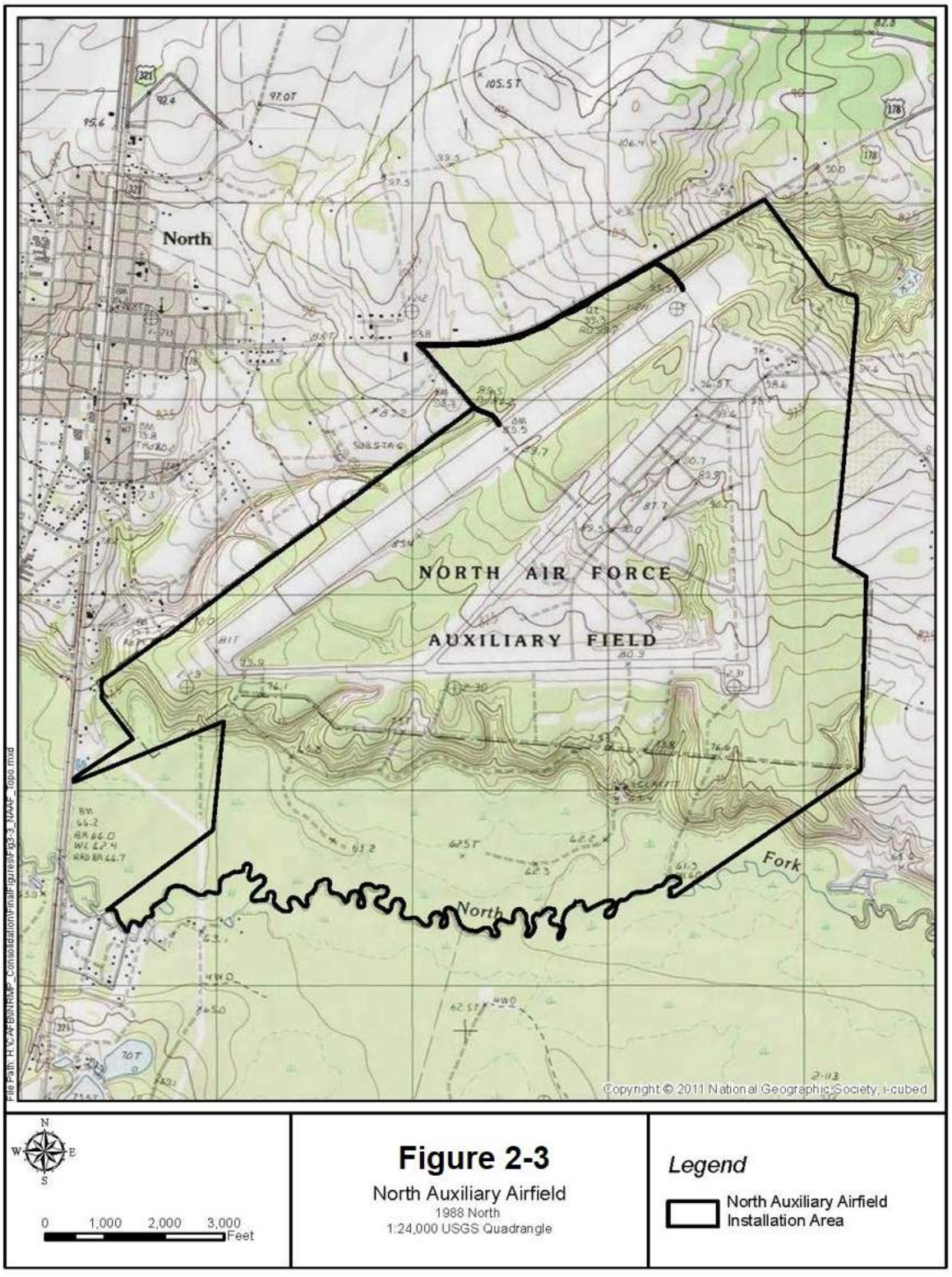

Figure 2-3. North Auxiliary Airfield

The NAAF is nearly triangular in shape and occupies 2,392 acres, of which 1,150 acres are undeveloped. Approximately 15 percent of the land area of NAAF is characterized as improved grounds and includes runways and surrounding areas, a fire station and other support facilities including an aerial delivery facility, a fueling station, a water storage system, and a network of paved and unpaved roads. Approximately 25 percent of the land area requires periodic maintenance (i.e., areas between and around runways). The remaining 60 percent consists of upland and wetland forests.

Developed portions of the installation consist of a 12,000-foot primary runway, a 5,000-foot secondary runway, a 3,000-foot assault landing strip for C-17 aircraft, and a 5,000-foot parking ramp. Undeveloped acreage is available to authorized participants of the JB CHS hunting and fishing program.

JB CHAS Weapons Station

JB CHS Weapons Station is located in Berkeley and Charleston Counties on the west bank of the Cooper River approximately 15 miles north of Charleston, South Carolina, and 13 miles inland from the Atlantic Ocean (32°51'09" North latitude and 79°57'24" West longitude) (Figure 2-4). JB CHS Weapons is situated approximately 5 miles northeast of JB CHS Air and is bordered by the City of Goose Creek and the City of Hanahan to the west and Berkeley County to the north and east. A portion of the South Annex at JB CHS Weapons is bordered by Charleston County and the City of North Charleston.

The facility consists of four tracts that total 16,950 acres. The Northside tract is located north of Foster Creek; the Marrington tract is located north of Red Bank Road (SC Hwy 29) and south of Foster Creek; the Eastside tract is located south of Red Bank Road (divided into Eastside restricted and unrestricted); and the Southside tract is located south of Goose Creek and north of Remout Road. Of the nearly 17,000 acres of land, approximately 7,000 are developed for administrative and industrial use by the military and for family housing. The remaining estimated 10,000 acres are heavily forested and/or wetland areas managed for fish, wildlife, timber, and outdoor recreation.

There are 16 miles of waterfront at JB CHS Weapons, four deep-water piers, 38 miles of railroad, and 292 miles of road. It has an integrated rail-head and surge mobilization capability and over 11,000 active duty/civil service/contractor personnel in 43 tenant commands. There are more than 1,600 buildings on the installation ranging from small office space to warehouse facilities encompassing more than 42 million square feet. State-of-the-art facilities include the Naval Information Warfare Center Atlantic (NIWC), the Nuclear Power Training Unit (NPTU), and the Naval Nuclear Power Training Command (NNPTC).

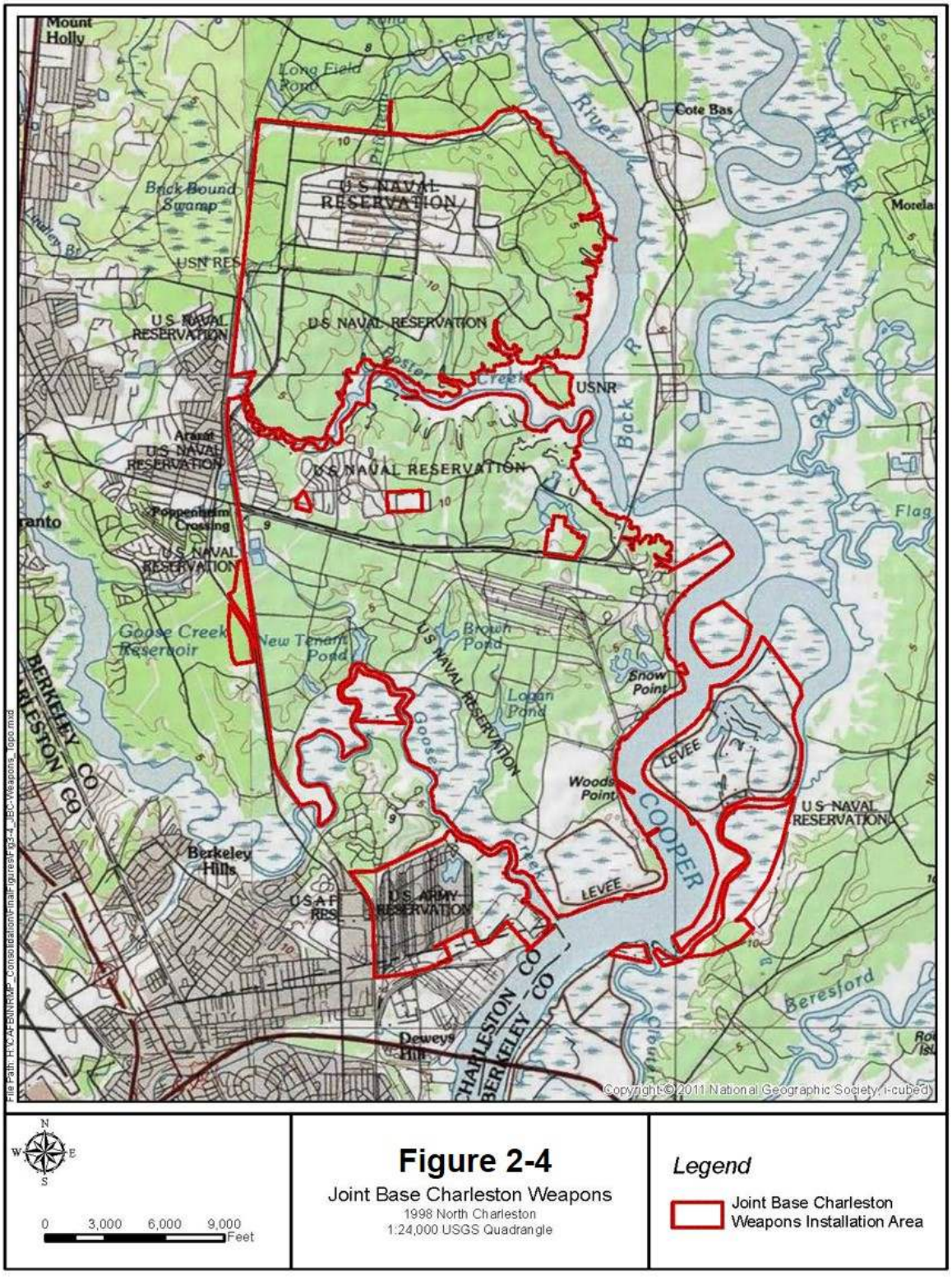

Figure 2-4. Joint Base Charleston Weapons

Installation/GSU Location and Area Descriptions

Installation/ Geographically Separated Unit (GSU)	Main Use/ Mission	Acreage	Addressed in INRMP?
Air Base	Command and support for airlift of troops and passengers, military equipment and supplies. Other mission requirements range from supporting U.S. embassies to supplying humanitarian airlift relief to disaster victims.	3,772	INRMP Coverage
North Auxiliary Airfield	Practice landings and takeoffs by the Airlift Wings based at JB CHS Air. The NAAF provides a remote training field and also serves as an alternate landing site for emergency situations.	2,392	INRMP Coverage
Weapons Station	Approximately 40% is of Weapons Station is used for administrative and industrial activity and family housing. Sixty percent is managed for natural resources and outdoor recreation.	16,950	INRMP Coverage

2.1.2 Installation History

The Charleston AFB (including NAAF) and Naval Weapons Station Charleston merged into JB CHS on 01 October 2010. JB CHS was established in accordance with congressional legislation implementing the recommendations of the 2005 Base Realignment and Closure (BRAC) Commission. The legislation ordered the consolidation of military installations, which were adjoining but separate, into single joint base installations – JB CHS was one of 12 joint bases formed in the United States as a result of the law.

A brief overview of the history of the JB CHS Air Base, NAAF, and JB CHS Weapons is given below.

Air Base

JB CHS Air Base was first used as a Municipal Airport for the area in 1931. The site was activated as an Army air base shortly after the Japanese attack on Pearl Harbor in 1941, and was used as a combat training site for air depot and services personnel as well as a base of operations for anti-submarine patrols. Throughout the war, JB CHS Air Base served as a training base, air evacuation, and refueling station. The Base was closed after World War II and the property was returned to the City of Charleston. In 1952, the Base was reactivated and expanded with an agreement between the City of Charleston and the Air Force to jointly use the runways. Since that time several different missions have been assigned to JB CHS Air Base. Operating as an Air Mobility Command (AMC) base and both the Air Force and the Charleston County Aviation Authority utilize the runways under the joint use agreement.

In 1996, JB CHS Air acquired Hunley Park, a housing area developed in the early 1960s, from the United States Navy. It consists of 271 acres, mostly residential, adjacent to and south of Base property (Figure 2-2). Hunley Park is bordered on the east by Dorchester Road on the west by the Ashley River and is comprised of 452 military family housing units and associated common facilities.

North Auxiliary Airfield

NAAF was acquired by the War Department between 1942 and 1945. The original dirt runway was constructed in 1943 and used by Hughes Aircraft Company for testing. It was used as a heavy bomber-training site throughout World War II, and was controlled afterward by the Eighth Air Force, Donaldson AFB, Greenville, SC. In 1956, control was transferred to the Ninth Air Force, Shaw AFB, SC, and the Base continued to be used as a remote operational training site both for tactical and airdrop missions. In 1979, real property, accountability, jurisdiction, and control transferred to the Charleston Air Force Base.

Weapons Station

JB CHS Weapons Station was commissioned as the U.S. Naval Ammunition Depot in 1941. The original site, what is now the Eastside Area, included 6,700 acres. In 1954, the area that is now the Northside tract was acquired from the Army. In December 1970, the Navy acquired the Marrington tract from the West Virginia Pulp and Paper Company.The 907-acre Southside Area, acquired by DoD in 1918 to construct the Charleston Army Depot, was transferred to the Navy in 1981.

The U.S. Naval Ammunition Depot was used as an ammunition collection and distribution point during World War II. Ammunition manufactured throughout the country was sent to the Base and loaded onto ships. After the war, the depot oversaw the removal of ordnance from deactivated ships. There was minimal activity at the Base for the next several years. In the mid-1950s, the station experienced renewed activity when its mission was expanded to include the handling of guided missiles. Base personnel were tasked with arming submarines with the UGM-27 Polaris missile. In 1960 the Polaris Missile Facility Atlantic (POMFLANT) was constructed. More facilities were built in 1965 to accommodate the handling of Terrier, Tartar, and Hawk missiles. Buildings were added again in 1969 for the Standard and Red Eye missiles.

2.1.3 Military Missions

The 628th ABW is host wing for installations support and is guided by the following mission statement:

> The 628th ABW provides unsurpassed installation support to 53 DoD and federal agencies, servicing a total force of over 79,000 airmen, sailors, soldiers, Marines, Coast Guardsmen, civilians, dependents, and retirees at JB CHS, maintains $2.0B of physical infrastructure across 23,000 non-contiguous acres and provides mission-ready expeditionary airmen to combatant commanders in support of joint and combined operations.

The 628th ABW includes four operational groups consisting of 21 squadrons and one wing staff directorate. The four operational groups consist of operations, maintenance, mission support and medical. The mission of the 628th ABW is to command assigned airlift and supporting units; provide for the airlift of troops and passengers, military equipment, mail, and aeromedical airlift; to participate in operations involving the air-land or airdrop of troops, equipment, and supplies when required; and to support U.S. embassies by supplying humanitarian airlift relief to victims of disasters.

Approximately 3,156 active duty military personnel are assigned to JB CHS Air Base. Of this total, approximately 1,462 reside on Base, while the remaining 1,694 live in the surrounding community. In addition to the active duty Air Force personnel, Charleston is home to approximately 2,441 Air Force reservists serving in the 315th AW. The Base also employs some 1,344 civilian workers. The combined military, reservist, and civilian workforce is approximately 6,941 persons (Zapata, 2010).
NAAF is integral to the JB CHS Air mission, and serves as an airdrop for special operations and a field training site. The 628th Mission Support Group, Civil Engineer Squadron (CES), operates the Base and

directly supports the 628th AW C-17 Globemaster III aircrew training program. Units from the U.S. Army, Army Reserve, Army National Guard, and U.S. Air Force plus Joint Task Forces use the Base for a variety of training including Air National Guard units from North and South Carolina, Georgia, and Tennessee. In addition, NAAF supports the Civil Air Patrol Reserve Officer Training Corps (ROTC) and Boy Scouts of America for encampments.

Temporarily assigned firefighters manage the NAAF site working 24 hour rotating shifts. The only permanent employee assigned to the Airfield is a civilian groundskeeper. Aerial Delivery personnel from JB CHS Air provide recovery of air dropped pallets.

Air Base Tenants

315th Airlift Wing

The 315th AW is a parallel, co-located Air Force Reserve Command group that augments the 628th ABW providing a large part of the AMC's Global Reach airlift capabilities. The 315 AW is an Associate Reserve component with three major functional areas and 19 subordinate units, which operate under the direction of three group commanders. These areas are operations, logistics, and support and aeromedical evacuation.

Aircrews of the 315th AW fly the C-17 Globemaster III aircraft which are assigned to the host 628th ABW. These reservists directly support their active duty counterparts in operation and training, maintenance, aerial port, civil engineering, personnel, communications, and provide aeromedical evacuation capability. Under conditions of heightened tensions up to and including full mobilization, personnel of the 315 AW augment the 628 ABW to ensure full utilization of the active wing's aircraft, maintenance, and aerial port facilities.

Composed of both full-time Air Reserve Technicians and weekend Reservists, the 315th AW's three maintenance squadrons are totally integrated with the 628 ABW and perform one-third of the Base's aircraft maintenance workload. The three flying squadrons, the 300th, 317th, 701st Airlift Squadrons, fly about 30 percent of the airlift missions. In addition, the 315th AW provides Charleston's only aeromedical evacuation squadron.

Additional Tenant Units

- 1st Combat Camera Squadron;
- 373rd Training Squadron, Detachment 5;
- 412th Logistics Support Squadron OL-AC;
- Air Force Office of Special Investigations Detachment 310 Office of Special Investigation;
- Air Force ROTC Detachment 772 (Charleston Southern University);
- American Federation of Government Employees (Local 1869);
- American Red Cross;
- Area Defense Counsel;
- Army Air Force Exchange Service;
- Boeing C-17 Field Service;
- Boeing C-17 Recovery and Modifications;
- Civil Air Patrol (Coastal-Charleston Composite Squadron);
- Defense Commissary Agency;
- Pratt & Whitney;
- Southeast Air Defense Sector OL-A;
- United Airlines; and
- U.S. Navy Construction.

Weapons Station
JB CHS Weapons' primary missions are to provide quality and responsive logistic, technical, and material support to the fleet and other customers in the areas of combat subsystems, equipment, components, and retail ammunition management; maintain and operate an explosive ordnance out-loading facility; provide homeport services; and perform other tasks as assigned by higher authority. JB CHS Weapons is home to approximately 5,800 military personnel and 4,300 civilian personnel.

JB CHS Weapons hosts over 40 tenant commands and includes a large training center function that includes NNPTC, NPTU, and a branch of the Federal Law Enforcement Training Center (FLETC). The installation also houses the Naval Consolidated Brig Charleston (NAVCONBRIG); Naval Munitions Command Atlantic, Unit Charleston (NMCLANT); Marine Corps Reserve Center; and the NIWC. JB CHS Weapons utilizes 269 above-ground ammunition magazines for storage of military ordnance including mines, missiles, and shells. The Base also hosts the Army Field Support Battalion - Charleston (AFSBn –CHS), an Army logistics hub, and consequently, is the busiest continental United States surface port in the defense transportation system.

JB CHS Weapons contains more than 1,800 on-base houses for DoD enlisted and officers and their dependents as well as Coast Guard personnel, has a child care facility, and hosts public elementary and middle schools.

2.1.4 Natural Resources Needed to Support the Military Mission

The primary natural resources needed to support the military mission on JB CHS are healthy ecosystems surrounding flight-lines, training, testing and munitions storage areas. The base supports an EOD range, two outdoor small arms firing ranges, two NIWC testing areas, and thousands of acres of safety zones sourrounding munitions storage areas. Additonally, natural resources contribute heavily to the Quality of Life values on the base providing areas many miles of recreational trails, hunting and fishing opportunities, recreational fields and areas for organized Physical Training exercises.

2.1.5 Surrounding Communities

Land Use

JB CHS Air is located in Charleston County approximately 10 miles northwest Charleston within the corporate boundaries of the City of North Charleston (Figure 2-2). The town of Goose Creek is situated to the north; the town of Hanahan and JB CHS Weapons are situated to the northeast; North Charleston and Charleston are generally to the south; and the town of Summerville lies further to the northwest.

The principal interstate highway in the vicinity of JB CHS Air Base is I-26, which connects Charleston to Columbia and Spartanburg. A second Interstate, I-526, is a beltway that loops Charleston metropolitan area from U.S. Highway 17 south of Charleston to U.S. Highway 17 north in Mount Pleasant. These two interstate highways intersect just southeast of the JB CHS Air boundary and provide excellent access. Local access from I-26 is provided by Aviation Avenue, which extends westward from the interstate to Arthur Drive on the eastern side of the Base. The closest source of commercial airline service is Charleston International Airport located adjecent and directly south of the Air Base.

The property at JB CHS Air is somewhat triangular in shape and is generally bordered by Ashley Phosphate Road to the north; I-26 to the east; I-526, the Mark Clark Expressway, to the south; and Dorchester Road (S.C. Highway 642) to the west (Figure 2-2). Land use surrounding the Base is largely urbanized. Commercial and industrial land uses dominate areas immediately to the north, east, and southeast of the Base. Residential land use is prevalent to the west and is constrained by the Ashley River.

Encroachment Issues

Urban encroachment, if unregulated, can compromise the utility and efficiency of military operations. For example, certain land uses such as homes, schools, shopping centers, restaurants, and other places of assembly are uses that may be incompatible if located too close or within the general proximity of military bases. When community members are exposed to greater noise, accident potential, and other negative externalities associated with military installations, they search for relief. Naturally this results in public pressure on the military base commander to modify or restrict certain operations. These constraints can lead to a base closure. Urban encroachment is a major factor taken into consideration during the BRAC process. JB CHS is involved in two partnerships to address encroachment issues: a Joint Land Use Study (JLUS) and a Greenbelt Partnership.

The JLUS is a cooperative land use planning effort between military installations and surrounding communities designed to promote compatible community growth that supports military training and operational missions. JB CHS Air has partnered with JB CHS Weapons, the Berkeley, Charleston, and Dorchester Council of Government, the Charleston Metro Chamber of Commerce, and others to complete the JLUS. The JLUS identifies actions that can and should be taken jointly by the surrounding community and military installation to solve existing encroachment problems and prevent future ones. Land use tools recommended as a result of the study include an AICUZ Overlay District and a Transfer of Development Rights (TDR) program. The AICUZ Overlay District is a regulatory technique to guide land use, development and construction activity within specific areas along the periphery of JB CHS Air and Weapons. The TDR program is a market driven, voluntary program to redirect land development away from the JB CHS AICUZ zones. Other recommendations included infrastructure improvements (runway rehabilitation and extension), additional partnering opportunities through the Encroachment Partnering Program and the Readiness Environmental Protection Initiative (REPI), among others.

Launched in 2004, the REPI is part of DoD's overall Sustainable Ranges Initiative, a multi-level effort designed to ensure the future use of military training land by addressing issues of potential encroachment on military training. This effort emphasizes the need for installations to look "outside the fence" to work constructively and creatively with communities and other stakeholders. JB CHS continues to explore a partnership with Charleston County to combine funds and support from the Charleston County Transportation Sales Tax with funding from the joint DoD /U.S. Department of Agriculture REPI to provide grants to implement the County's Greenbelt Plan for the conservation of greenspace in Charleston County.

Demographics

Communities surrounding JB CHS Air and JB CHS Weapons have experienced a high level of residential growth and commercial development over the past 15 years. From 2000 to 2010, Charleston County grew by 40,240 people (13 percent) to an estimated population of 350,209. Similarly, the population for the nearby City of North Charleston grew by 22 percent to 97,471 during the same period and the City of Goose Creek grew by 23 percent to 35,938 people. The dominant ethnicity for the surrounding communities is White; the per capita income ranges from just under $22,000 for Berkeley County to nearly $31,000 for the City of Charleston; and the percent poverty ranges from approximately 7 percent for Goose Creek to over 17 percent for the City of Charleston (Table 2-1).

Charleston County has a diverse economy providing history, culture, entertainment, education, and recreation to area residents and visitors. The City of Charleston has become an increasingly popular tourist destination, driven largely by the concentration of historic buildings located within the city's historic district. These factors, coupled with the coastal setting and favorable climate, combine to offer an outstanding quality of life for residents (Zapata, 2010).

The economy of Charleston continues its robust growth with strong sectors in tourism and the service industry. The medical industry accounts for approximately 16,000 jobs associated with the Medical University of South Carolina and several hospitals. Charleston is also home to one of the largest containerized cargo ports on the Southeast Atlantic and Gulf Coasts. More than eight million tons of cargo pass through the Port of Charleston each year including 6.8 million tons through the container port alone. Future developments on Daniel Island and the Cainhoy areas as well as new industry in the region ensure sound economic growth for years to come.

Table 2-1. Socioeconomics for communities surrounding JB CHS Air Base and Joint Base Charleston Weapons

Socioeconomic Element	Charleston County	Berkeley County	Orangeburg County	City of Charleston	City of Goose Creek	City of North	State of South Carolina
Geography							
Land Area (square miles)	916	1,099	1,106	109	40	N/A	30,061
Persons/square miles	382	162	84	1,102	896	N/A	154
Population							
2010	350,209	177,843	92,501	120,083	35,938	813	4,625,364
2000	309,969	142,651	91,582	96,650	29,208	791	4,012,012
Percent Change	13	25	1	24	23	-2.7	9.7
Ethnicity							
White (percent)	64	66	34	70	71	N/A	66
Black (percent)	30	25	62	25	18	N/A	28
Native American (percent)	0.3	0.6	0.5	0.2	0.5	N/A	0.4
Asian (percent)	1.3	2.3	0.8	1.6	3.7	N/A	1.3
Other (percent)	0.1	0.1	0	0.1	0.1	N/A	0.1
Economics							
Per capita income	28,963	21,979	17,612	30,865	22,549	13,495*	23,196
Percent poverty	16.5	15.2	24.5	17.2	7.4	N/A	16.4

* Population in July 2009

N/A = not available

North Auxiliary Airfield

NAAF is situated in a rural setting in Orangeburg County, South Carolina. The town of North, South Carolina is situated approximately 3 miles to the west-northwest (Figure 2-3). The City of Orangeburg is located approximately 15 miles to the southeast. Highway 178 generally borders NAAF to the north; Highway 321 runs north-south through the town of North and west of the installation; Slab Landing Road (State Road 38-73) is situated to the east. The North Fork of the Edisto River forms the southern boundary. Agricultural land and woodlands adjoin the northeastern and eastern boundaries of NAAF. Lands to the west and northwest are mixed rural residential. NAAF is well buffered from encroachment due to the rural nature of the surrounding area.

From 2000 to 2010, Orangeburg County grew by only 919 people (one percent) to an estimated population of 92,501. In 2009, North had a population of 791, down nearly three percent from 2000.The per capita income for Orangeburg County is $17,612 and for the City of North is just under $13,500, both below the state level. Likewise, the poverty rate for the county is also high (24.5 percent, Table 2-1).

Weapons Station

JB CHS Weapons is located in Berkeley and Charleston Counties north of Charleston and northeast of JB CHS Air Base (Figure 2-4). The towns of Goose Creek and Hanahan are to the west and southwest, respectively; the cities of North Charleston and Charleston are to the south. The installation is bounded by Henry E. Brown, Jr. Boulevard to the west; Remount Road and I-526 to the South; the Cooper and Back Rivers to the east; and is bisected by Foster Creek to the north and Goose Creek to the south.

Adjoining land use to the south and west is largely urbanized due to the proximity of North Charleston and the town of Goose Creek, respectively. Areas to the north and east are largely woodlands and open water. Demographics and strategies to address encroachment issues for JB CHS are discussed above.

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2.1.6 Local and Regional Natural Areas

Air Base and Weapons

The JB CHS is situated near the interface of the lower Middle Atlantic Coastal Plain and the Southern Coastal Plain (Level III) eco-regions. The land area at JB CHS Air is classified as largely Carolina Flatwoods (Level IV) eco-region; the land area at JB CHS Weapons is classified as both the Carolina Flatwoods and Sea Islands/Coastal Marsh (Level IV) eco-regions (Griffith et al., 2002). Carolina Flatwoods are characterized by flat plains on lightly dissected marine terraces with swamps, low gradient streams with sandy and silty substrates, and Carolina bays. Sea Islands/Coastal Marsh is characterized by barrier islands, dunes, beaches, lagoons, estuaries, and tidal marshes.

Goose Creek Reservoir is a 600-acre impoundment located in lower Berkeley County, approximately 2 miles northeast of JB CHS Air and two miles west of JB CHS Weapons. It has a paved boat-landing with double launching ramps and a dock. The reservoir extends from the dam to about four miles north where it passes under NAD Road almost to Hwy 52 at the Goose Creek city limits. While the south end of the reservoir is mostly open marshlands the north end of the impoundment is developed. Approximately a half-mile above the landing on the eastern shore is an area of small trees that provide nesting for a large rookery of snowy egrets and white ibis in season.

Francis Marion National Forest is situated east of JB CHS and is bounded to the north by Santee River. The Intracoastal Waterway and the Atlantic Ocean are to the east. It is a lush landscape of pine stands, swamps and marshes shaded by towering bald cypress trees. Four wilderness areas, one with a marked

canoe trail, offer visitors a unique opportunity to glimpse the wild landscape as it might have appeared earlier in history.

There are also numerous ponds and swamps in the vicinity of the installations that are associated with the Ashley/Cooper river system.

North Auxiliary Airfield

The NAAF is situated in the Southeastern Plains (Level III) eco-region. The northern part of the installation is classified within the Atlantic Southern Loam Plains (Level IV) eco-region characterized by dissected smooth plains and irregular plains; broad interstream divides and mostly gentle side slopes dissected by many small, low to moderate gradient sandy bottomed streams; and Carolina bays (Griffith et al., 2002).

The southern portion of NAAF, along the North Fork of the Edisto River, is classified as Southeastern Floodplains and Low Terraces. This classification is associated with major river floodplains and low terraces, low gradient streams with sandy and silty substrates and oxbow lakes, ponds, and swamps.

There are no significant natural areas in the vicinity of NAAF.

2.2 Physical Environment

2.2.1 Climate

Coastal South Carolina has a humid subtropical climate with mild winters, hot, humid summers, and significant rainfall all year long. Summer is the wettest season. Almost half of the annual rainfall occurs during the summer months. Thunderstorms are common, resulting in peak monthly rainfall amounts during July, August, and September. Rainfall is lowest during the months of October, November, and December. Fall remains relatively warm through November. Winter is short and mild and is characterized by occasional rain. Snow flurries seldom occur, although in 2010, 3.4 inches fell on February 12, the heaviest snowfall in 20 years. The highest temperature recorded was 104°F (June 1985), and the lowest temperature recorded was 10°F (January 1985). Violent storms usually accompany squall lines and cold fronts in the spring. These storms are characterized by lightning, hail, and high winds, and they sometimes spawn tornados. Hurricanes are a major threat to the area during the summer and early fall. Hurricane season begins in late June, with the greatest potential for severe storms in August and September. Hurricane Hugo, a Category 4 storm, hit Charleston on September 21, 1989.

The mean monthly temperature and precipitation for Charleston and NAAF is summarized in Table 2-2. The average annual precipitation is 51.5 inches at Charleston and 47.4 inches at NAAF. At JB CHS, the average annual temperature is 65°F, and at NAAF it is 63°F. July tends to be the hottest month, with average temperatures of 80°F at NAAF and 81°F at JB CHS. January is the coldest month with average temperatures of 44ºF at NAAF and 51ºF at JB CHS. Minimum temperatures of less than 32ºF occur on about 10 days near the coast, increasing to 70 days in the northern portion of the state.

The growing season in Charleston is 294 days. In the central region of the state, the average date of the last freezing temperature in the spring ranges from March 10 in the south to April 1 in the north. Fall frost dates range from late October in the north to late November in the south.

Table 2-2. Average climate data for Charleston and North Auxiliary Airfield

Month	30-Year Average Temperature (°F)		30-Year Average Precipitation (inches)	
	Charleston	NAAF	Charleston	NAAF
January	47.9	45.1	4.1	4.8
February	50.7	48.2	3.1	3.6
March	57.7	55.7	4.0	4.2
April	64.2	62.9	2.8	2.7
May	72.1	71.0	3.7	3.6
June	78.2	77.6	5.9	4.9
July	81.7	81.0	6.1	5.1
August	80.5	79.7	6.9	5.1
September	76.1	74.4	6.0	4.2
October	66.2	63.7	3.1	3.1
November	58.0	55.2	2.7	2.7
December	50.5	47.3	3.2	3.3
Average	**65.3**	**63.5**	**4.3**	**4.0**
Annual Total	**---**	**---**	**51.5**	**47.4**
Source: National Climatic Data Center				

Climate projections for Joint Base Charleston (JB CHS) Air Base, JB CHS Weapons, and NAAF are presented in Tables 2-3 through 2-5. These projections are described in greater detail in the JBCHS climate change assessment (section 14.2). The results suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030, and extracted data from 2046 to 2055 for the decadal average for 2050.

Joint Base Charleston Air Base

For the decade centered around 2030, both scenarios project a similar degree of increase in average annual temperature (TAVE) of between 2.1 °F (1.2 °C) and 2.2 °F (1.2 °C) over the historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 3.1 °F (1.7 °C). RCP 8.5 expresses a slightly greater warming of 3.7 °F (2.1 °C) for this period (Table 2-3).

Average annual precipitation (PRECIP) varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, RCP 4.5 scenario projects an increase in PRECIP of 26% while RCP 8.5 shows an increase of 14%. For 2050 RCP 4.5 projects an increase in PRECIP of 20% while RCP 8.5 shows a smaller increase of 16%.

Table 2-3. Summary climate data, JB CHS Air Base.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	50.9	64.1	61.1	58.3	59.0
TMIN (°F)	56.0	58.1	59.2	57.9	59.3
TMAX (°F)	75.4	77.5	78.4	77.8	79.4
TAVE (°F)	65.7	67.6	68.7	67.8	69.3
GDD (°F)	6387	7035	7306	7024	7450
HOTDAYS	41.9	67.7	80.2	69.8	94.3
WETDAYS	1.8	4.5	3.5	2.3	3.1

Notes: TAVE ºF = annual average temperature; TMAX ºF = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD ºF = Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

North Auxiliary Air Field

For the decade centered around 2030, both scenarios project a similar degree of increase in average annual temperature (TAVE) of between 2.4 °F (1.3 °C) and 2.7 °F (1.5 °C) over the historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 and RCP 8.5 both expressing a warming of 3.5 °F (1.9 °C) and 4.2 °F (2.3 °C), respectively (Table 2-4).

For 2030, both scenarios project an increase in PRECIP of 11%. For 2050, RCP 4.5 projects an increase of 20% while RCP 8.5 projects an increase of 14%.

Table 2-4. Summary climate data, NAAF.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	49.4	54.6	59.1	54.8	56.2
TMIN (°F)	52.1	54.1	55.5	54.4	55.9
TMAX (°F)	76.1	78.8	79.8	79.1	80.7
TAVE (°F)	64.0	66.4	67.6	66.7	68.2
GDD (°F)	6069	6681	6967	6729	7114
HOTDAYS	66.6	98.6	109.6	98.2	119.9
WETDAYS	1.2	0.4	0.2	1.0	0.9

Notes: TAVE ºF = annual average temperature; TMAX ºF = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD ºF = Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day

Joint Base Charleston Weapons

For the decade centered around 2030, both scenarios project a similar degree of increase in average annual temperature (TAVE) of between 2.0 °F (1.1 °C) and 2.1 °F (1.2 °C) over the historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 2.9 °F (1.6 °C). RCP 8.5 expresses a slightly greater warming of 3.5 °F (1.9 °C) for this period (Table 2-5).

For 2030, RCP 4.5 scenario projects an increase in PRECIP of 22% while RCP 8.5 shows an increase of 11%. For 2050 the scenarios also project an increase in precipitation of 17% (RCP 4.5) and 14% (RCP 8.5), respectively.

Table 1-5. Summary climate data, JB CHS Weapons.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	51.1	62.3	59.9	56.7	58.0
TMIN (°F)	55.7	57.7	58.7	57.6	58.9
TMAX (°F)	75.5	77.5	78.3	77.8	79.3
TAVE (°F)	65.5	67.5	68.4	67.6	69.1
GDD (°F)	6363	6963	7215	6961	7356
HOTDAYS	43.1	67.7	77.7	68.2	92.7
WETDAYS	1.7	3.2	2.1	1.9	2.0

Notes: TAVE ºF = annual average temperature; TMAX ºF = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD ºF = Average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

2.2.2 Landforms

JB CHS Air and JB CHS Weapons facilities are situated in the Atlantic Coastal Plain physiographic province of South Carolina. In South Carolina, the Coastal Plain extends from the Fall Line[1] east to the coastline. Elevations here range from 270 to 300 feet above mean sea level (MSL) inland to sea level at the coast. This province is broadly characterized by a general downward slope toward the sea punctuated by a series of fluvial and coastal terraces.

The South Carolina Coastal Plain may be divided into four sub-areas: 1) the Sandhills; 2) the Inner (or Upper) Coastal Plain; 3) the Outer (or Lower) Coastal Plain; and 4) the Coastal Zone (often included in the Outer Coastal Plain). The Inner and Outer Coastal Plains are separated by a partially eroded terrace ridge

[1]The Fall Line in South Carolina is oriented southwest to northeast across the middle of the state. It is the boundary that separates the Piedmont from the Coastal Plain, across which rivers from the upland region drop to the plain as falls or rapids.

known as the Orangeburg Scarp or Escarpment, or the Citronelle Escarpment. The Inner Coastal Plain in many ways resembles parts of the Piedmont and Sandhills, as the topography is rather hilly in places, and the landscape is heavily dissected by stream erosion. Stream gradients range from 15-20 feet per mile. Elevations vary from 300 feet near the Sandhills to about 125 feet at the Orangeburg Scarp. The width of this sub-region varies from 10-40 miles. Local topographic relief is usually measured in tens of feet, and slopes range from gentle in the southeastern border area to moderate along the Sandhills boundary. NAAF is situated in the northwest area of Orangeburg County in the upper reaches of Inner Coastal Plain. NAAF's topography ranges from 61 feet above MSL along the North Fork of the Edisto River to approximately 100 feet above MSL in the northern part of the airfield (Figure 2-3).

The much flatter and almost featureless Lower Coastal Plain slopes gradually toward the ocean in a series of at least seven steps or terraces, separated by escarpments which reflect temporary sea level positions throughout relatively recent (Pliocene and Pleistocene) geologic time. An additional escarpment is currently forming along the present-day sea level position. Elevations range from 125 feet to near sea level and local topographic relief is seldom more than 20 feet. The nearly level modern plain is characterized by a large number of meandering streams and rivers with broad floodplains.

The Coastal Zone encompasses a narrow area along the coast dominated by tidal rivers, creeks, and marshlands where development is mostly limited to the broad, flat peninsulas between tidal areas. Both JB CHS Air Base and JB CHS Weapons are situated within the Coastal Zone. The Air Base is located approximately 16 miles northwest of Charleston harbor and is situated between the Ashley and Cooper Rivers. The topography of the Base is relatively flat, with surface elevations varying from an average of 15 feet above MSL along the southern end of the Base to 45 feet above MSL at the northern end (Figure 2-2). JB CHS Weapons is located north of the City of North Charleston and just west of the Cooper River. The topography of the Base is also relatively flat, with surface elevations varying from an average of 5 feet above MSL along the southern edge of the Base to 10 feet above MSL at the northern edge (Figure 2-4).

2.2.3 Geology and Soils

This section describes the regional geology, seismology, and soils at JB CHS facilities.

2.2.3.1 Geology

The Atlantic Coastal Plain is characterized by marine terraces formed during periods of higher sea levels during the Pleistocene Period that have been covered in some areas by Holocene Period deposits. The surficial geology of the Coastal Plain consists of thin sediment layers of shallow marine origin, primarily consisting of fine sand and blue or gray clay underlain by the Cooper Marl geologic formation of the Oligocene Age. This fine granular layer occurs approximately 60 feet below the surface and is composed of glauconite and foraminifera deposits that vary in thickness from 30 to 200 feet. Underlying the Cooper Marl is the Santee Limestone of the Eocene Age with a thickness of approximately 250 feet.

The geology of the Inner and Outer Coastal Plain is presented in the following sections. NAAF is situated in the Inner Coastal Plain. For the purposes of this report, JB CHS is lumped into the discussion of regional geology for the Outer Coastal Plain.

Inner Coastal Plain

The Inner Coastal Plain, in which JB CHS Air's NAAF is situated, is underlain by sediments that date from the Cretaceous to the middle Miocene, approximately 135 million years ago (Colquhoun 1969). The surficial geologic units include the Middendorf, Barwell, and McBean Formations that are comprised of

loosely consolidated sediments overlain by coarse sand to sandy loam soils. Streams deeply incise these porous materials and shallow, surficial aquifers discharge into streambeds to support stream base-flow during periods of low rainfall. The surficial aquifers also absorb large quantities of water and reduce quantities of water and peak runoff to streams. Relief within the airfield property is moderate (50 to 60 feet) except to the south near the North Fork Edisto River, where steep slopes descend to the river's floodplain.

Outer Coastal Plain

The Outer Coastal Plain of South Carolina consists of a series of layers of unconsolidated sediments and partially lithified sedimentary rocks ranging in age from from the Late Cretaceous to the Holocene age. These units strike northeast-southwest dipping seaward to the southeast. They are thickest near the coast and thin to the northwest to a feather edge at the Fall Line. The deposits also thicken southward from 980 feet near the coast at the North Carolina-South Carolina border to more than 3,280 feet at the South Carolina-Georgia border (Colquhoun et al., 1983).

The coastal terrace deposits average between 30 and 40 feet in thickness and consist primarily of sand, silt, and clay with commonly occurring seashells that were deposited during a series of marine transgressions and regressions during the Pleistocene and Pliocene Epochs (Aucott et al., 1987). The Ladson Formation is the principal coastal terrace deposit in the vicinity of JB CHS and is the most widespread Pleistocene marine deposit in the Charleston area. The Ladson Formation consists of layered sequences of fine- to coarse-grained sand and clay that were deposited in a shallow marine environment with a basal phosphatic conglomerate layer (Malde, 1959). An evaluation of the Ladson Formation, as it exists at JB CHS, was conducted using data collected from previous investigations. The shallow subsurface geology of the Ladson Formation consists of sand with some silt and intermittent clay and clay stringers. The lower part of the Ladson Formation is predominately clay with some sand, silt, and in some locations, shell fragments and/or phosphate nodules. The clay content tends to increase with depth toward the base of the formation.

Underlying the Ladson Formation is the Cooper Marl[2], a massive, impermeable, olive colored, fine-grain carbonate deposit approximately 200-feet thick near JB CHS. It consists of calcium carbonate, phosphate, fine-grained sand, and clay that were deposited in a relatively deep-water marine environment rich in foraminifera. The Cooper deposits, which dip to the southeast at eight to 24 feet per mile, pinch out about 20 miles north of Charleston and thicken south of the city. Due to the high clay content, only a few feet of the Cooper Marl needs to be present to effectively retard the vertical movement of groundwater (Park, 1985). Based on all available information, it is considered a confining unit that allows virtually no vertical migration of groundwater from the surficial aquifer to the deeper aquifers. The Cooper Marl typically is encountered within approximately five to 35 feet of the surface throughout most of the Base. As part of the background study conducted by Halliburton (1995) at JB CHS Air, five soil borings were drilled into the top of the Cooper Marl. Data collected from the soil borings were used to verify that it is relatively impermeable and that it acts as a confining unit. In addition, some of the monitoring well borings drilled during previous investigations were drilled into the top of the Cooper Marl. Using the data from these boring logs, it was determined that the upper part of the Cooper Marl at JB CHS consists of an olive-colored, calcareous, stiff clay with silt and a trace of fine sand.

Overall, the Ladson Formation can be characterized as a unit of poorly graded sands (i.e., absence of a uniform grain-size distribution), interbedded with non-plastic silty sands and clays, and the Cooper Marl

[2]Marl is defined by the American Geological Institute (1976) as calcareous clay or an intimate mixture of clay and particles of calcite or dolomite that usually contains fragments of shells.

can be characterized as sandy elastic silts, fine inorganic silts, and high-plasticity clays. Generally, plasticity and clay content increases with depth. Moisture contents, void ratios, and porosity also increase with depth which may indicate an under-consolidated condition.

Below the Cooper Formation is a sequence of sedimentary units greater than 2,000-feet thick (approximately 3,000 feet below MSL at JB CHS) that extend to the crystalline basement rocks. This sequence of sedimentary deposits below the Cooper Marl includes (in increasing age): the Santee Limestone (180-feet thick); the Black Mingo Group (200-feet thick); and the Peedee, Black Creek, Middendorf, and Cape Fear formations (1,700-feet thick) (Colquhoun et. al., 1983).

The crystalline basement near JB CHS lies below approximately 3,000 feet of Cretaceous or younger sediment, partially consolidated sediment and weathered bedrock (saprolite). It consists of diabase, basalt, quartz and metasedimentary rocks. The pre-Cretaceous metamorphic and igneous rocks are believed to be similar to the metamorphic and igneous rocks that crop out in the Piedmont physiographic province located in the northwest portion of South Carolina.

2.2.3.2 Seismology

South Carolina averages 10-15 earthquakes a year below magnitude three. Seismic activity occurs within the pre-Cretaceous rocks beneath the Lower Coastal Plain which indicates active faults and fracture zones. The greatest earthquake frequency is along the central coastline of the state in the Charleston area. The Charleston area is within Seismic Risk Zone two according to the 1991 Uniform Building Code Seismic Zone Map. The Charleston Earthquake of 1886 was the largest quake to ever hit the Southeastern United States. This 7.2 magnitude earthquake killed 60 people and destroyed much of the city. Faults in this region are difficult to study at the surface due to thickness of overlying sediments. Many of the ancient faults are within plates rather than along plate boundaries.

2.2.3.3 Soils

Coastal Plain soils are derived from sea floor sediments deposited during periods of higher sea level. In South Carolina, Coastal Plain soils are generally formed from marine deposits of sand, clay, and limestone over granite and other crystalline substances. As the sea level dropped, surface waters, winds, and floods reworked the marine sediments, and channels were cut into the surface by streams and tidal creeks.

South Carolina's Coastal Plain soils are relatively infertile. Generally, they are sandy to loamy sand in the upper 12 inches, with subsoil of loamy sand to loam. Hard pans restrict the root zone unless broken by deep plowing. Available water is generally in the top two feet.

The following sections describe soils at JB CHS Air, NAAF, and JB CHS Weapons facilities. A discussion of soil associations is given along with a list of soil series mapped by the Natural Resources Conservation Service (NRCS) (Table 2-6).

Table 2-6. Soil series mapped at Joint Base Charleston facilities

Air	NAAF	Weapons
Albany fine sand (0-2 percent slopes)	Ailey sand	Aquic undifluvents
Capers silty loam	Alpin sand	Bayboro
Chipley fine sand (0-2 percent slopes)	Dothan loamy sand	Bethera
Chisolm fine sand (0-6 percent slopes)	Faceville loamy sand	Bohicket
Coosaw fine sand	Fuquay sand	Bonneau
Dawhoo and Rutledge loamy fine deep sand	Johns sandy loam	Borrow pit
Echaw fine sand	Johnston sandy loam	Cainhoy
Hobcaw fine sandy loam	Lucy loamy sand	Capers
Lakeland sand	Lynchburg fine sandy loam	Caroline
Leon fine sand	Mouzon fine sandy loam	Chipley-Echaw
Lynn Haven loamy fine sand	Neeses loamy sand	Craven
Meggett fine sandy loam	Noboco loamy sand	Duplin
Ogeechee fine sandy loam	Orangeburg loamy sand	Goldsboro
Rains sandy loam	Rains sandy loam	Lenoir
Stono fine sandy loam	Troup sand	Leon
Tidal marsh	Udorthents, loamy	Lucy
Udorthents sandy and loamy		Lynchburg
Wadmalaw fine sandy loam		Meggett
Wagram loamy fine sand		Norfolk
Williman loamy fine sand		Ocilla
Yauhannah loamy fine sand (0-2 percent slopes)		Pantego
Yemassee loamy fine sand		Pickney
Yonges fine sandy loam		Rains
		Santee
		Seagate
		Udorthents
		Wahee
		Witherbee

Sources: NRCS 1993, NRCS 1988, NRCS 1980, NRCS 1971.

Air Base

The soils in Charleston County are mostly used for row crops, close-growing crops, vegetables, and pasture. Soil types in Charleston County range from the frequently flooded Tidal Marsh group along the coast to the well-drained Wando-Seabrook group developed on level terrain or gentle slopes. Surface soils are typically sand and sandy loam; subsurface soils typically have increasing clay content with depth (Miller, 1971). Permeability is relatively high in surface soils (6.0 to 20 inches per hour), but decreases with increasing clay content and depth (0.06 to 6.0 inches per hour). The increase in clay content and the decrease in permeability with depth cause rapid saturation of the sandy surface soils following rains.

The NRCS completed preliminary soils mapping of JB CHS Air in 1993 (NRCS, 1993). Twenty-three soil series have been mapped across the installation (Table 2-6). The major soil types identified within the Hunley Park and Main Base Housing Areas are Capers silty loam; Chipley loamy fine sand; Dawhoo and Rutledge loamy fine deep sand; Lakeland sand; Rains sandy loam; Stono fine sandy loam; Tidal Marsh; Wadmalaw fine sandy loam; Wagram loamy fine sand; Wicksburg loamy fine sand; and Urban land – Yauhanna – Yemasse - Ogeechee association.

The predominant type of soil underlying the Hunley Park area is Lakeland sand. This soil consists of acid soils that are sandy throughout with deep, nearly level to gently sloping layers and rapid permeability (Miller, 1971). The predominant type of soil underlying the Main Base area is the Urban land – Yauhanna – Yemassee – Ogeechee association. These soils are sandy loam towards the top and silty clay increasing with depth. They are moderately well drained with 0 to 2 percent slopes (NRCS, 1993).

North Auxiliary Airfield

NAAF has much greater topographical relief than JB CHS Air. NRCS has identified and mapped 16 different soil types at NAAF (Table 2-6; NRCS, 1988). There are significant constraints on land use for the Mouzon fine sandy loam, the Johnson sandy loam, and the Lynchburg fine sandy loam due to wetness and periodic flooding. These soils are within delineated wetlands.

Weapons Station

Soil surveys were published in 1980 for Berkeley County (NRCS, 1980), and in 1971 for Charleston County (NRCS, 1971). Soil series mapped at JB CHS Weapons are listed in Table 2-6. The major soil series are Bethera, Bonneau, Duplin, Goldsboro, Meggett, Wahee, and Craven. The tidal flats are composed primarily of two series, Bohicket and Capers. These soil series are categorized into nine soils associations:

- Cainhoy-Pickney;
- Bonneau-Norfolk-Pantego;
- Goldsboro-Lynchburg-Rains;
- Wahee-Duplin-Lenoir;
- Chipley-Echaw-Pickney;
- Bethera-Bayboro-Pantego;
- Meggett;
- Bohicket-Capers; and
- Borrow Pits.

Only the Cainhoy-Pickney association is moderately suited for development of residential, industrial, or recreational uses. The Bonneau-Norfolk-Pantego association is suited for only recreational uses. The remainder of the soils are poorly suited for all development because of a variety of conditions, including tidal inundation, high water table, wetness, slow permeability, and poor drainage. None of the soils at JB CHS Weapons are classified as prime or unique farmland soils.

2.2.4 Hydrology

This section includes information about the hydrology at JB CHS facilities. Included are subsections describing surface hydrology, floodplains/wetlands, groundwater hydrology, water use, and water quality for each installation. JB CHS Air and Weapons facilities are situated in the Santee River Basin. NAAF is situated in the Edisto River Basin.

2.2.4.1 Air Base

Surface Hydrology

The hydrology of JB CHS Air is influenced by a combination of low elevation with little relief, shallow depth to groundwater, and runoff from developed areas. Much of the installation's natural hydrology has been altered by historic land use (strip mining) and modern development. Large pits and furrows, a result of early (1867-1937) phosphate strip mining activities, are evident throughout undeveloped areas to the south. These pits and furrows have affected wetlands near the edge of the Base. Recent land use development that affects Base hydrology includes large areas of impervious surface, road berms, culverts and runway, and road drainage ditches. The ditches were likely formed at the time of construction of the installation (Charleston AFB, 2003a).

- The rivers and streams of Charleston County generally flow in a southeast direction. JB CHS Air is situated between the Ashley and Cooper Rivers. The western portion of the Base borders the Ashley River, which is associated with an extensive tidal marsh. The primary streams receiving runoff from the Base include Popperdam Creek, Runway Creek, and Turkey Creek (Figure 2-5). These streams in turn discharge to either the Ashley River or Cooper River. The major surface water drainages on the Base are Golf Course Creek, Runway Creek, and Turkey Creek. In general, they are small headwater streams that originate on Base property.

- **Golf Course Creek** - In the western part of the Base the drainage area for Golf Course Creek encompasses the majority of the Base industrial area, golf course, and Main Base and Hunley Park Housing Areas. Upper tributary reaches are concrete lined channels. Golf Course Creek flows southwest into Popperdam Creek, which flows south to the Ashley River.

- **Runway Creek** - Located near Runway 03/21, Runway Creek drains much of the runway area and flows southwest from the Base into the Ashley River. It is largely channelized and/or piped.

- **Turkey Creek** - Located near Runway 15/33, Turkey Creek flows east and northeast from the Base into Goose Creek, a tributary of the Cooper River.

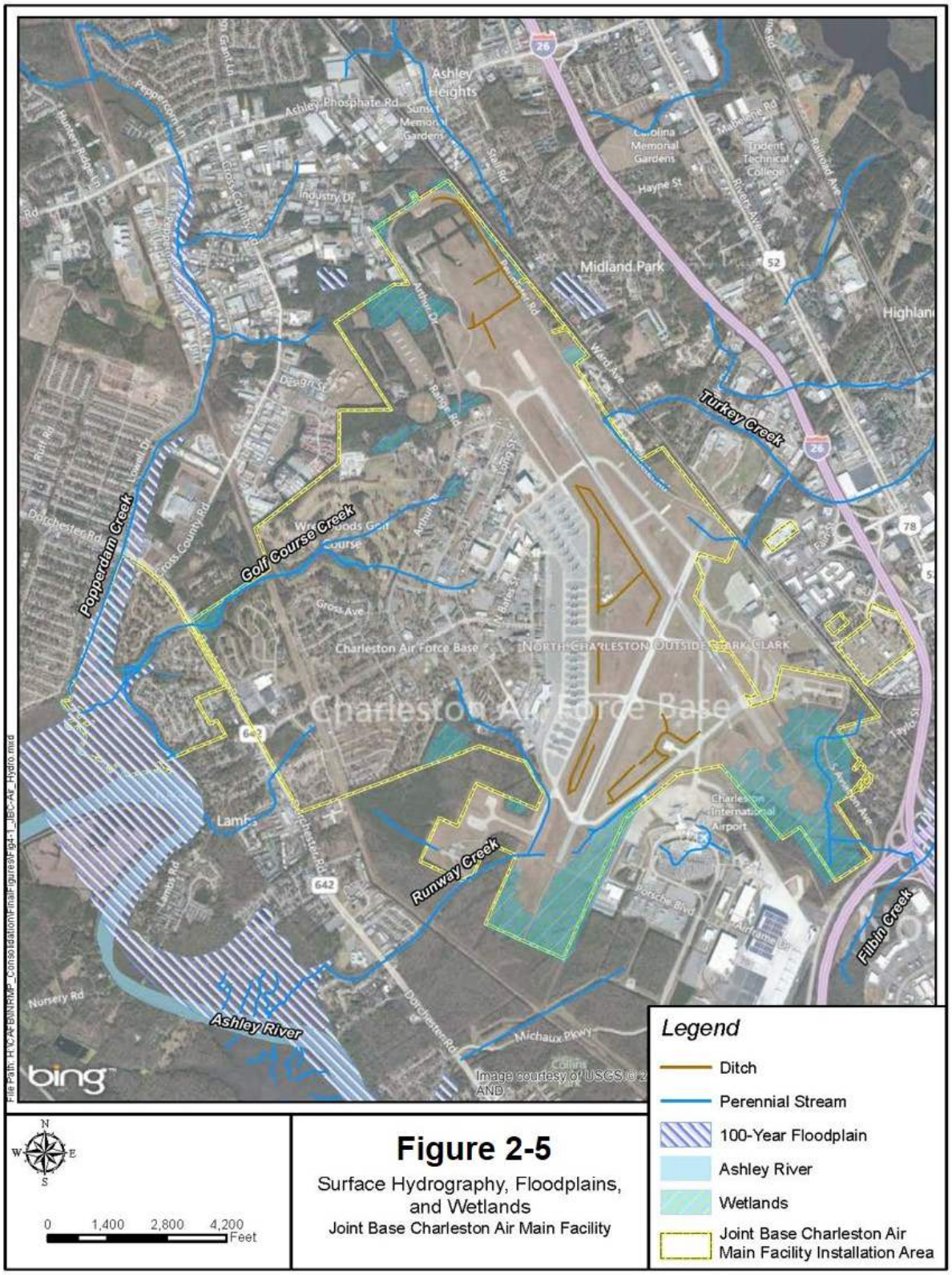


Figure 2-5. Surface hydrography, floodplains, and wetlands – JB CHS Air Base

A major drainage divide is located along the western edge of Runway 15/33. Surface water collected at areas east of the drainage divide eventually drains into Goose Creek and the Cooper River. These areas include the airfield and associated pavements. A small area at the southern end of Runway 15/33 drains into a wetland located east of the Base, on the east side of South Aviation Avenue.

The majority of the maintenance facilities along the flightline, Base shops, and housing areas eventually drain into the Ashley River. A small area at the southwest edge of the Base drains to a tributary of the Ashley River. Flooding occasionally occurs due to flat topography, high water table, and extensive wetlands.

JB CHS Air has implemented a Storm Water Pollution Prevention Plan (SWPPP) to minimize the risk of storm water pollution in drainage areas located within the Base boundaries. The Base is divided into 13 individual drainage areas for storm water management. Additional information regarding the storm water system for JB CHS Air is found in the SWPPP (Advent, 2011).

Floodplains/Wetlands

The western portion of the Hunley Park Housing Area (Parcels A and B) is within the 100-year floodplain (Figure 2-5). All other areas of JB CHS Air are outside the 100-year floodplain of both the Ashley and Cooper Rivers. Part of the clear zone south of Runway 33 is located within the 500-year floodplain of Filbin Creek. Because this area is a clear zone, development would be subject to Federal Emergency Management Agency (FEMA) flood criteria (Charleston AFB, 2003b). No development has occurred or is planned within either of these floodplains, with the possible exception of a future dock or observation deck in the tidal marsh.

A total of 354 acres of wetlands have been identified and delineated at JB CHS Air (Charleston AFB, 2003a). More information on wetlands at JB CHS Air is provided in Section 2.3.5.

Groundwater

There are three aquifer systems near JB CHS Air, including an unconfined surficial aquifer system, a confined Tertiary aquifer system, and a confined Cretaceous aquifer system (Table 2-7). The unconfined surficial system is 20- to 40-feet thick near JB CHS Air and has a depth of approximately 0.25 to 13 feet below ground surface. The water table varies from about one to six feet below ground surface throughout the year, and wells can produce up to 200 gallons of water per minute. However, in most areas, chlorides far exceed drinking water standards. Therefore, many areas in coastal South Carolina depend on surface water supplies. The surficial aquifer groundwater flow tends to be south-southwest.

Table 2-7. Aquifer systems in the South Carolina Coastal Plain

Aquifer System	Aquifers Included
Cretaceous (confined)	Middendorf Black Creek Peedee
Tertiary (confined)	Ellenton Black Mingo Tertiary Sand Tertiary Limestone
Surficial (unconfined)	Orangeburg Group Cooper Group Ladson Formation

The confined Tertiary aquifer system, which is made up of the Santee Limestone and Black Mingo Group, is approximately 400-feet thick near JB CHS Air. Groundwater flow in this system tends to be to the east. The Black Mingo is an artesian limestone formation that varies in thickness from 18 to 58 feet and is the primary source of well water for most of Berkeley County. Average yield for this aquifer is approximately 100 gallons per minute.

The confined Cretaceous aquifer system, made up of sands and clays of the Peedee, Black Creek, Middendorf, and Cape Fear Formations, is approximately 2,000 feet thick near JB CHS Air. It is isolated from the Tertiary system by 300 feet of impermeable material. Groundwater flows to the east, with water being produced only under artesian conditions (USAF, 1996, 1998).

Water Use

JB CHS Air purchases drinking water from the Charleston Water System. All sanitary and most industrial wastewater is discharged to the North Charleston Sewer District for treatment.

Water Quality

Section 303(d) of the Clean Water Act requires all states to develop a list of waterbodies that do not meet water quality standards according to their designated use[3]. The purpose of the list is to identify impaired waters and the cause of impairment so that corrective actions can be implemented to improve water quality. The U.S. Environmental Protection Agency (EPA) mandates that the 303(d) list of impaired waters be developed by states every two years and submitted to EPA for approval for those waterbodies that fail to meet water quality standards and thus do not meet their designated use. Once a site is included on the 303(d) list, a Total Maximum Daily Load (TMDL) or must be developed within two to 13 years of initial listing. A TMDL is the amount of a single pollutant (such as bacteria, nutrients, metals) that can enter a waterbody on daily basis and still meet state water quality standards.

In South Carolina, TMDLs are developed and proposed by the South Carolina Department of Health and Environmental Control (SCDHEC) and then forwarded to EPA Region 4 for final approval. The most recent approved list for South Carolina is the 2010 303(d) list (http://www.scdhec.gov/environment/water/tmdl/index.htm#303d). There are 26 water quality monitoring stations (WQMS) in the vicinity of JB CHS Air and Weapons that are on the 303(d) list of impaired waterbodies (Figure 4-2, Table 4-4). Of the 26 303(d) listed stations, 10 are situated within the Ashley River drainage area surrounding JB CHS Air and 16 are situated within the Cooper River drainage area surrounding JB CHS Weapons. These stations are currently situated within designated TMDL watersheds. TMDLs have been developed and approved for six of these station locations. The remainder are listed as impaired with no TMDL.

The Ashley and Cooper Rivers in the vicinity of JB CHS Air and Weapons are classified as freshwaters (FW[4]) and tidal saltwaters (Class SA and SB[5]), as per SCDHEC's R.61-68, *Water Classifications & Standards* (2008). Designated uses for waters in the vicinity of JB CHS Air and Weapons include uses

[3]Designated uses are recognized uses of Waters of the State established by state and federal water quality programs.

[4]***Freshwaters (FW)*** are freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department; suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora; suitable also for industrial and agricultural uses.

[5]***Class SA*** and ***SB*** are tidal saltwater's suitable for primary and secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption and uses listed in Class SB; also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora.

that support aquatic life[6], recreation[7], and fish consumption (Table 2-8). Causes of impairment for 303(d) listed stations surrounding JB CHS Air include most commonly (low) dissolved oxygen and (high) fecal coliform, and less commonly high ammonia, mercury (for fish consumption), turbidity, and copper.

There are five WQMS that correspond to impaired stream segments on the 2010 303(d) list that are potentially affected by industrial activities at JB CHS Air. They include MD-049 and MD-052 on Ashley River; MD-039 on Goose Creek; and MC-03 and MD-249 on Filbin Creek (Figure 2-6, Table 2-8). Ashley River has an approved TMDL for dissolved oxygen (http://www.scdhec.gov/environment/water/tmdl/docs/tmdlashl03.pdf).

JB CHS is required to verify the above information annually to determine: (1) the latest 303(d) listed stream segments potentially affected by JB CHS Air and (2) development status of TMDLs for applicable 303(d) listed stream segments. Should a TMDL be developed for a stream segment potentially affected by industrial activities at JB CHS, TMDL contribution and compliance must be addressed in the SWPPP through outfall monitoring and/or best management practices (BMPs), as approved by the SCDHEC (General Permit No. SCR000000, Part 1-D.1).

Facilities discharging storm water from areas associated with industrial activity to, or into a tributary to, an impaired stream segment for which a TMDL has been issued (except in the case of dissolved oxygen) shall implement a storm water sampling program for the pollutant(s) of concern for the TMDL. If JB CHS can provide written justification explaining why the pollutant(s) of concern is not expected to be present in the storm water discharges due to the nature of JB CHS's activities, the sampling program will not apply. This written justification from subject facilities may be submitted to SCDHEC at the time a facility performs its annual comprehensive site compliance evaluation.

2.2.4.2 North Auxiliary Airfield

Surface Hydrology

NAAF is bounded to the south by the North Fork of the Edisto River, which flows in a southeastern direction. Additionally, two unnamed streams have been identified at NAAF (Figure 2-7). They are small headwater streams that originate on the Base and flow south.

Floodplains/Wetlands

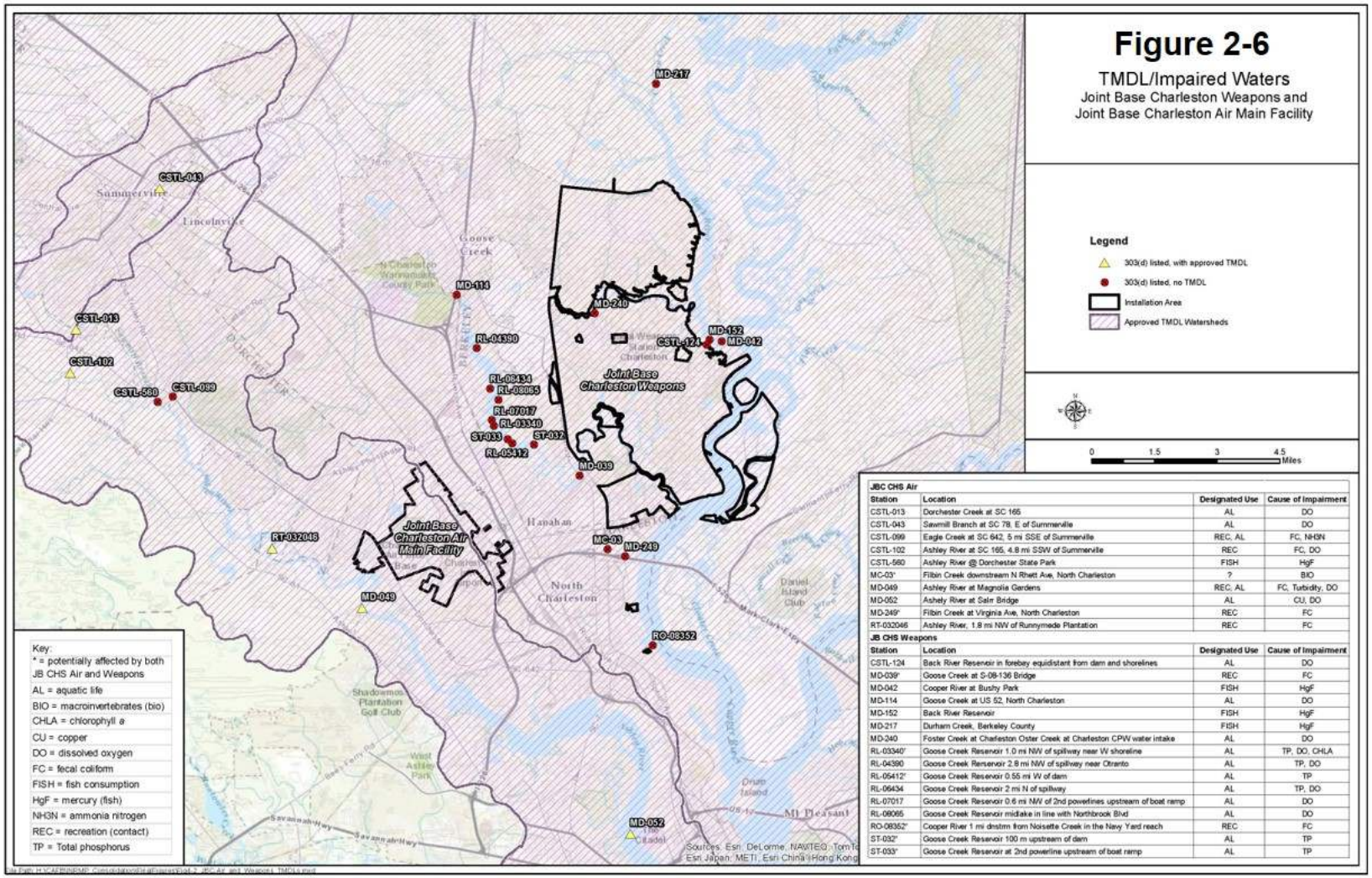
An extensive bottomland hardwood floodplain area associated with the Edisto River exists along the southern boundary at NAAF. FEMA does not have digital floodplain data available for NAAF. A total of 431 acres of wetlands have been identified at NAAF (Figure 2-7). More information on wetlands at NAAF is given in Section 2.3.5.

Groundwater

The Inner Coastal Plain, occupying the northwestern third of Orangeburg County near NAAF, is underlain by Middendorf, Tertiary Sands, and Shallow Aquifer systems (Table 2-7). Here the top of the Middendorf Aquifer ranges in depth from 300 to 700 feet below land surface. There is little data available for groundwater yields from this system in the northwest region of the county. However, a few wells

[6] ***Aquatic life uses*** include fishing, the survival and propagation of a balanced indigenous aquatic community (fresh and marine) of fauna and flora, shellfish harvesting, and crabbing.

[7] ***Recreational uses*** include swimming (primary contact) and/or boating/wading (secondary contact).



JBC CHS Air			
Station	Location	Designated Use	Cause of Impairment
CSTL-013	Dorchester Creek at SC 165	AL	DO
CSTL-043	Sawmill Branch at SC 78, E of Summerville	AL	DO
CSTL-099	Eagle Creek at SC 642, 5 mi SSE of Summerville	REC, AL	FC, NH3N
CSTL-102	Ashley River at SC 165, 4.8 mi SSW of Summerville	REC	FC, DO
CSTL-560	Ashley River @ Dorchester State Park	FISH	HgF
MC-03*	Filbin Creek downstream N Rhett Ave, North Charleston	?	BIO
MD-049	Ashley River at Magnolia Gardens	REC, AL	FC, Turbidity, DO
MD-052	Ashely River at Salm Bridge	AL	CU, DO
MD-249*	Filbin Creek at Virginia Ave, North Charleston	REC	FC
RT-032046	Ashley River, 1.8 mi NW of Runnymede Plantation	REC	FC
JB CHS Weapons			
Station	Location	Designated Use	Cause of Impairment
CSTL-124	Back River Reservoir in forebay equidistant from dam and shorelines	AL	DO
MD-039*	Goose Creek at S-08-136 Bridge	REC	FC
MD-042	Cooper River at Bushy Park	FISH	HgF
MD-114	Goose Creek at US 52, North Charleston	AL	DO
MD-152	Back River Reservoir	FISH	HgF
MD-217	Durham Creek, Berkeley County	FISH	HgF
MD-240	Foster Creek at Charleston Oster Creek at Charleston CPW water intake	AL	DO
RL-03340*	Goose Creek Reservoir 1.0 mi NW of spillway near W shoreline	AL	TP, DO, CHLA
RL-04390	Goose Creek Reservoir 2.8 mi NW of spillway near Otranto	AL	TP, DO
RL-05412*	Goose Creek Reservoir 0.55 mi W of dam	AL	TP
RL-06434	Goose Creek Reservoir 2 mi N of spillway	AL	TP, DO
RL-07017	Goose Creek Reservoir 0.6 mi NW of 2nd powerlines upstream of boat ramp	AL	DO
RL-08065	Goose Creek Reservoir midlake in line with Northbrook Blvd	AL	DO
RO-08352*	Cooper River 1 mi dnstrm from Noisette Creek in the Navy Yard reach	REC	FC
ST-032*	Goose Creek Reservoir 100 m upstream of dam	AL	TP
ST-033*	Goose Creek Reservoir at 2nd powerline upstream of boat ramp	AL	TP

Figure 2-6. Total Maximum Daily Load/Impaired Waters – JB CHS Air Base and Weapons

Table 2-8. 303(d) Listed streams near JB CHS Air Base and Weapons

Station	Location	Designated Use	Cause	303(d) Listed, with TMDL	303(d) Listed, no TMDL
JB CHS Air					
CSTL-013	Dorchester Creek at SC 165	AL	DO	✓	
CSTL-043	Sawmill Branch at SC 78, E of Summerville	AL	DO	✓	
CSTL-099	Eagle Creek at SC 642, 5 miles SSE of Summerville	REC, AL	FC, NH_3N		✓
CSTL-102	Ashley River at SC 165, 4.8 miles SSW of Summerville	REC	FC, DO	✓	
CSTL-560	Ashley River @ Dorchester State Park	FISH	HgF		✓
MC-03*	Filbin Creek downstream N. Rhett Ave., North Charleston	?	BIO		✓
MD-049	Ashley River at Magnolia Gardens	REC, AL	FC, Turbidity, DO	✓	
MD-052	Ashely River at Slann's Bridge	AL	CU, DO	✓	
MD-249*	Filbin Creek at Virginia Ave, North Charleston	REC	FC		✓
RT-032046	Ashley River, 1.8 miles NW of Runnymede Plantation	REC	FC	✓	
Joint Base Charleston Weapons					
CSTL-124	Back River Reservoir in forebay equidistant from dam and shorelines	AL	DO		✓
MD-039*	Goose Creek at S-08-136 Bridge	REC	FC		✓
MD-042	Cooper River at Bushy Park	FISH	HgF		✓
MD-114	Goose Creek at US 52, North Charleston	AL	DO		✓
MD-152	Back River Reservoir	FISH	HgF		✓

Station	Location	Designated Use	Cause	303(d) Listed, with TMDL	303(d) Listed, no TMDL
MD-217	Durham Creek, Berkeley County	FISH	HgF		✓
MD-240	Foster Creek at Charleston Oyster Creek at Charleston CPW water intake	AL	DO		✓
RL-03340*	Goose Creek Reservoir 1.0 miles NW of spillway near W shoreline	AL	TP, DO, CHLA		✓
RL-04390	Goose Creek Reservoir 2.8 miles NW of spillway near Otranto	AL	TP, DO		✓
RL-05412*	Goose Creek Reservoir 0.55 miles W of dam	AL	TP		✓
RL-06434	Goose Creek Reservoir 2 miles N of spillway	AL	TP, DO		✓
RL-07017	Goose Creek Reservoir 0.6 miles NW of 2nd powerline upstream boat ramp	AL	DO		✓
RL-08065	Goose Creek Reservoir midlake in line with Northbrook Blvd	AL	DO		✓
RO-08352*	Cooper River 1 mi downstream from Noisette Creek in the Navy Yard reach	REC	FC		✓
ST-032*	Goose Creek Reservoir 100 meters upstream of dam	AL	TP		✓
ST-033*	Goose Creek Reservoir at 2nd powerlines upstream of boat ramp	AL	TP		✓

Station	Location	Designated Use	Cause	303(d) Listed, with TMDL	303(d) Listed, no TMDL
Key: * stations potentially affected by both JB CHS Air and Weapons AL = aquatic life CHLA = Chlorophyll A CU = copper DO = dissolved oxygen FC = fecal coliform FISH = fish consumption HgF = mercury (fish) NH_3N = ammonia nitrogen REC = recreation (contact) TDML= Total Maximum Daily Load TP = Total phosphorus					

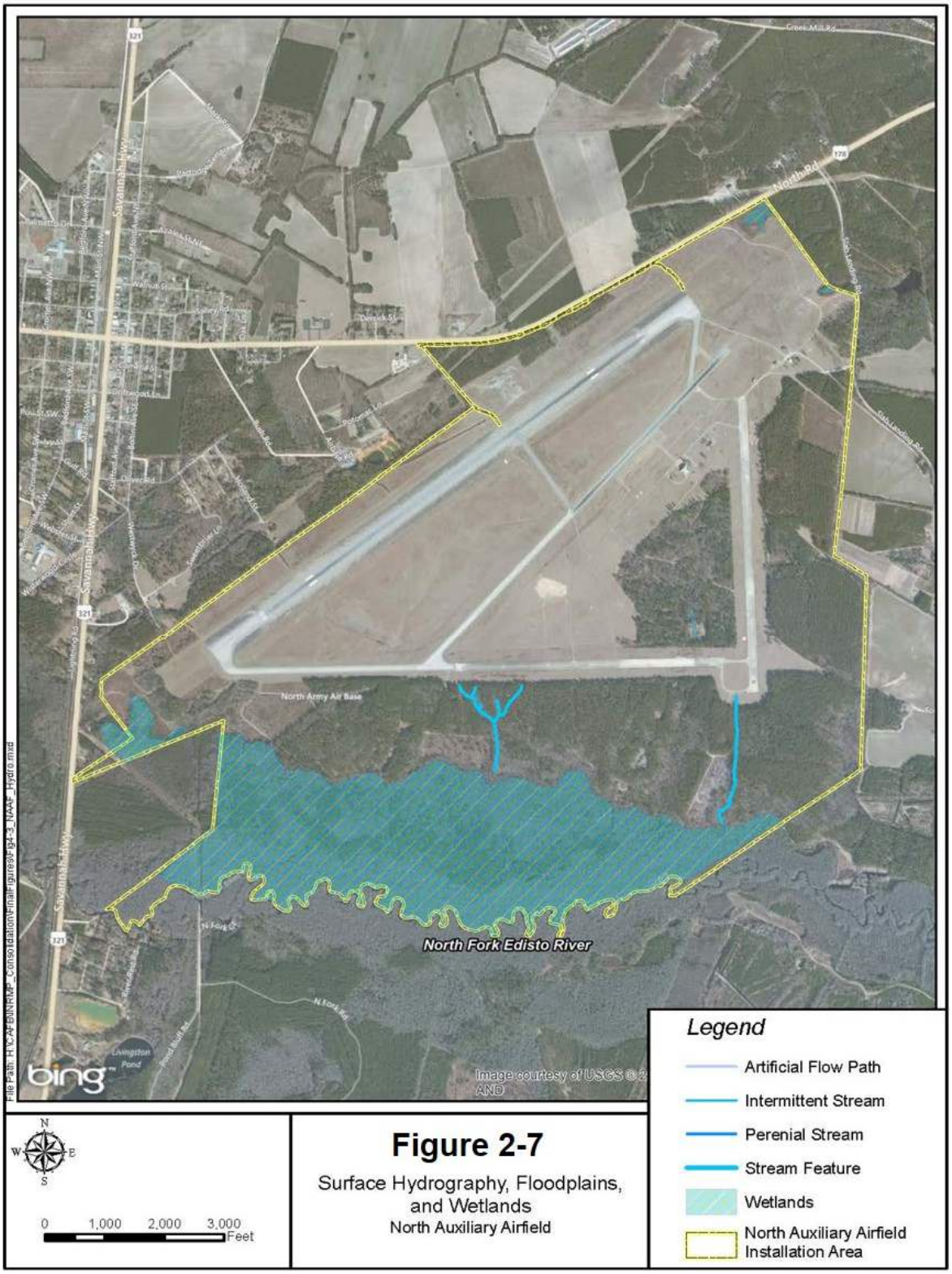


Figure 2-7. Surface hydrography, floodplains, and wetlands – North Auxiliary Airfield

near the town of North are screened in the Black Mingo and Peedee aquifer systems (Table 2-7) and withdraw a mixture of water from both.

Water Quality

There are four WQMSs in the vicinity of NAAF that are on the 303(d) list of impaired waterbodies (Figure 2-8, Table 2-9). TMDLs have not yet been approved for these station locations. The North Fork Edisto River in the vicinity of NAAF is classified as FW(freshwaters) (see footnote 4), as per SCDHEC's R.61-68, *Water Classifications & Standards* (2008). Designated uses for waters in the vicinity of NAAF include uses that support recreation (see footnote 7) and fish consumption (Table 2-9). Causes of impairment for 303(d) listed stations surrounding NAAF include (high) fecal coliform and mercury.

JB CHS is required to verify the above information annually to determine: (1) the latest 303(d) listed stream segments potentially affected by NAAF and (2) development status of TMDLs for applicable 303(d) listed stream segments. Should a TMDL be developed for a stream segment potentially affected by industrial activities at JB CHS, TMDL contribution and compliance must be addressed in the SWPPP through outfall monitoring and/or BMPs, as approved by the SCDHEC (General Permit No. SCR000000, Part 1-D.1).

Facilities discharging storm water from areas associated with industrial activity to, or into a tributary to, an impaired stream segment for which a TMDL has been issued (except in the case of dissolved oxygen) shall implement a storm water sampling program for the pollutant(s) of concern for the TMDL. If JB CHS can provide written justification explaining why the pollutant(s) of concern is not expected to be present in the storm water discharges due to the nature of JB CHS Air's activities, the sampling program will not apply. This written justification from subject facilities may be submitted to SCDHEC at the time a facility performs its annual comprehensive site compliance evaluation.

2.2.4.3 Weapons Station

Surface Hydrology

JB CHS Weapons lies in the Cooper River watershed approximately 16 river miles from the ocean. It is bounded on the southeast by the Cooper River and on the northeast by the Back River reservoir. It is bisected by two major creeks: Foster Creek to the north and Goose Creek to the south (Figure 2-9). Foster Creek empties into Back River. Back River and Goose Creek empty into the Cooper River. The mean tidal range of the Cooper River is 5.2 feet; normal tides vary from a minimum low of 1.1 feet to a maximum of 6.3 feet. Back River and Foster Creek have reduced tidal ranges because of the dam across the mouth of the Back River. However, the Cooper and Back Rivers are connected by Durham Creek, north of the station, which allows tidal exchange on the Back River. These major rivers and creeks are flanked by expanses of marshland and freshwater wetlands. Fingers of these marshes extend into the uplands along drainage ways. There are 17 freshwater ponds on the installation totaling 226 acres.

Floodplains/Wetlands

Flooding of the marsh and low areas occurs with tidal variations at JB CHS Weapons. The 100-year floodplain varies from 8.5 to 10.5 feet above MSL on the Base (Figure 2-9). The 100-year floodplain level at JB CHS Weapons has been identified by the U.S. Army Corps of Engineers (USACE) and encompasses lands along the Cooper River, Foster Creek, and Goose Creek. The 100-year floodplain level along the Cooper River is approximately 10.5 feet above MSL for the Northside, Southside - Main Station, and South Annex vicinities. Preliminary information developed for a project in the vicinity of Goose Creek indicates a floodplain that is approximately 12 feet above MSL along Goose Creek.

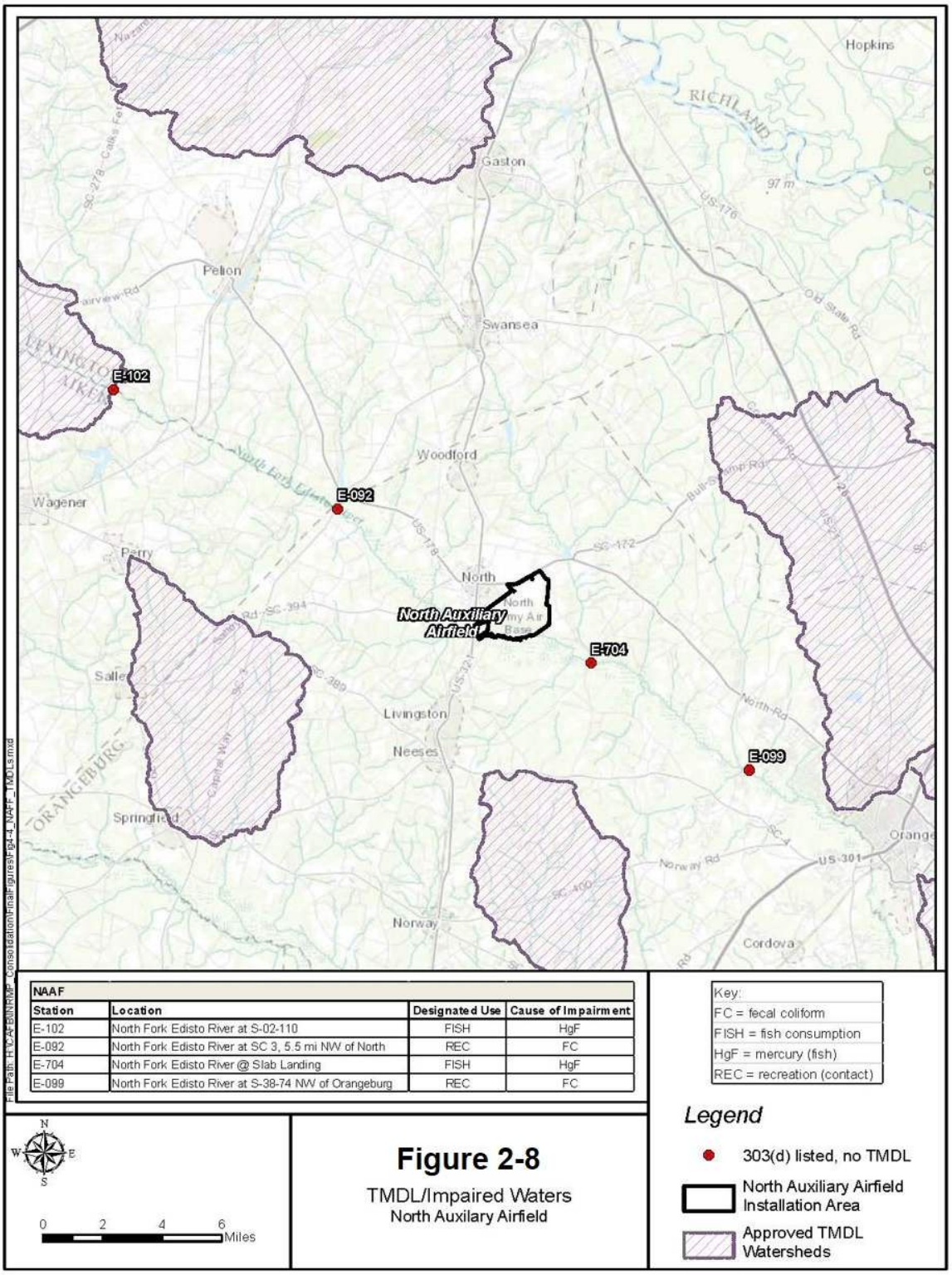


Figure 2-8. Total Maximum Daily Load/Impaired Waters – North Auxiliary Airfield

Table 2-9. 303(d) Listed streams near North Auxiliary Airfield

Station	Location	Designated Use	Cause	303(d) Listed, with TMDL	303(d) Listed, no TMDL
E-102	North Fork Edisto River at S-02-110	FISH	HgF		✓
E-092	North Fork Edisto River at SC 3, 5.5 miles NW of North	REC	FC		✓
E-704	North Fork Edisto River @ Slab Landing	FISH	HgF		✓
E-099	North Fork Edisto River at S-38-74 NW of Orangeburg	REC	FC		✓

Key:
FC = fecal coliform
FISH = fish consumption
HgF = mercury (fish)
REC = recreation (contact)
TMDL= Total Maximum Daily Load

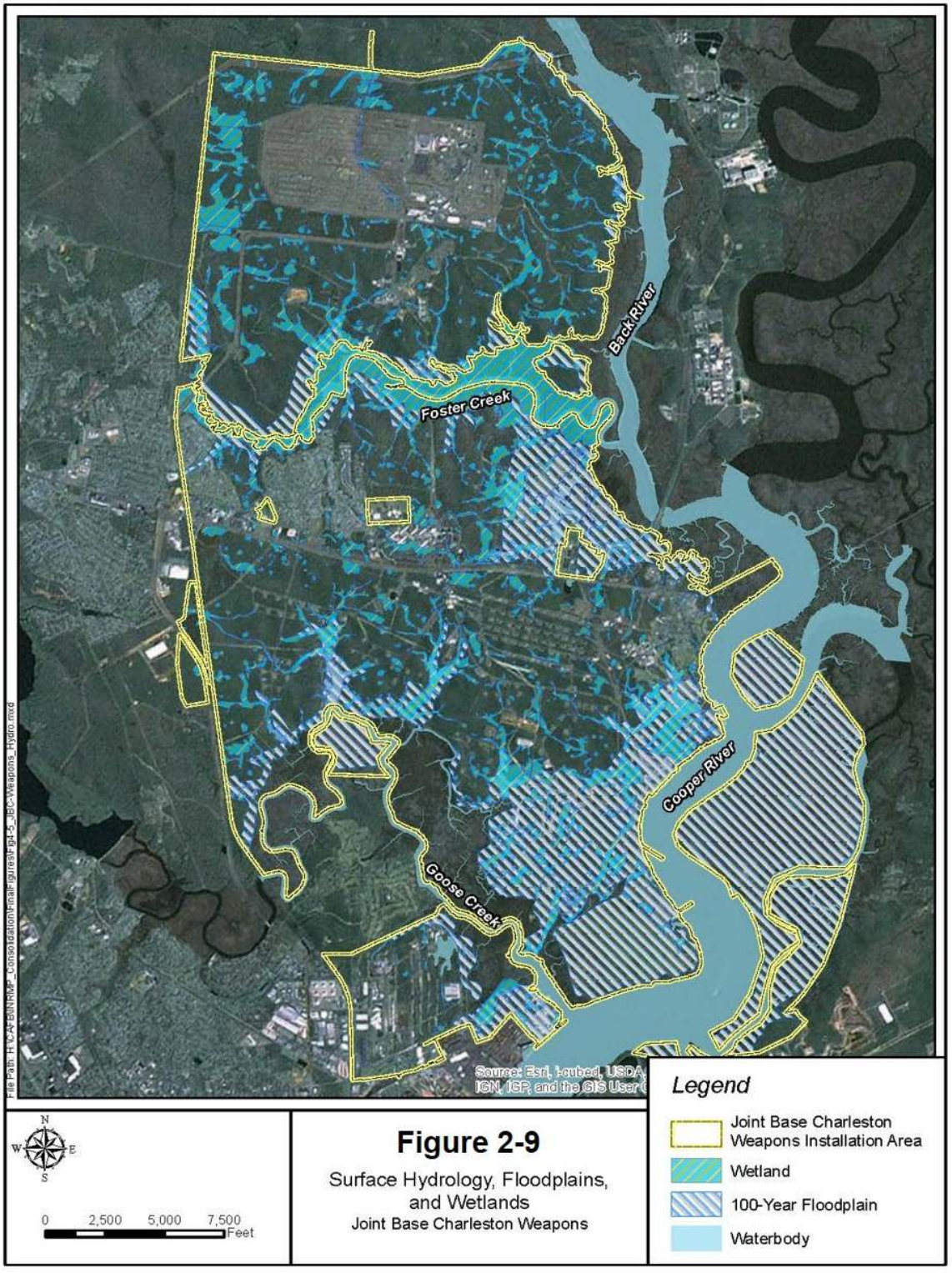


Figure 2-9. Surface hydrology, floodplains, and wetlands – Joint Base Charleston Weapons

Cooper River water flow is controlled by the Pinopolis Dam, which is located 17 miles north (upstream) of the station. The proximity of this dam and the relatively small catchment area of the Cooper River help to limit the potential flood hazards at the station.

The flow of water is usually increased from December through February to allow the dam to create more hydroelectric power, whereas local rainstorms with the heaviest rainfall usually occur from August through October. Therefore, there is very little probability of heavy releases from the dam to occur in phase with heavy localized flooding. In addition, surface drainage controls at the station consist of a network of drainage ditches, small dams, and retention ponds that are maintained to help detain surges of excessive surface water runoff during periods of intense rainfall.

Approximately 1,356 acres of tidal wetland and 1,664 acres of freshwater wetland have been identified at JB CHS Weapons (Figure 2-9). See Section 2.3.5 for more information on wetlands at JB CHS Weapons.

Groundwater

JB CHS Weapons is underlain by six major aquifer systems. In ascending order, they are the Middendorf, Black Creek, Pee Dee, Black Mingo, Tertiary Limestone, and surficial aquifer systems (Table 2-7).

Water Use

Potable water for JB CHS Weapons is provided by the North Charleston Public Services Authority. JB CHS Weapons does not operate public supply wells.

Water Quality

There are 26 water quality monitoring stations in the vicinity of JB CHS Air and Weapons that are on the 303(d) list of impaired waterbodies (Figure 2-6, Table 2-8).These stations are currently situated within designated TMDL watersheds. Of the 26 303(d) listed stations, 10 are situated within the Ashley River drainage area surrounding JB CHS Air and 16 are situated within the Cooper River drainage area surrounding JB CHS Weapons. None of the stations surrounding Weapons have approved TMDLs.

The Ashley and Cooper Rivers in the vicinity of JB CHS Air and Weapons are classified as FW(freshwaters)(see footnote 4) (and tidal saltwaters (Class SA and SB [see footnote 5]), as per SCDHEC's R.61-68, *Water Classifications & Standards* (2008). Designated uses for waters in the vicinity of JB CHS Air and Weapons include uses that support aquatic life (see footnote 6), recreation (see footnote 7), and fish consumption (Table 2-8). Causes of impairment for 303(d) listed stations surrounding JB CHS Weapons includes (low) dissolved oxygen, high Total Phosphorus and chlorophyll *a* (Goose Creek Reservoir), high fecal coliform, and mercury (for fish consumption).

JB CHS is required to verify the above information annually to determine (1) the latest 303(d) listed stream segments potentially affected by JB CHS Weapons and (2) development status of TMDLs for applicable 303(d) listed stream segments. Should a TMDL be developed for a stream segment potentially affected by industrial activities at JB CHS, TMDL contribution and compliance must be addressed in the SWPPP through outfall monitoring and/or BMPs, as approved by the SCDHEC (General Permit No. SCR000000, Part 1-D.1).

Facilities discharging storm water from areas associated with industrial activity to, or into a tributary to, an impaired stream segment for which a TMDL has been issued (except in the case of dissolved oxygen) shall implement a storm water sampling program for the pollutant(s) of concern for the TMDL. If JB CHS can provide written justification explaining why the pollutant(s) of concern is not expected to be present in the storm water discharges due to the nature of JB CHS Weapons activities, the sampling program will not

apply. This written justification from subject facilities may be submitted to SCDHEC at the time a facility performs its annual comprehensive site compliance evaluation.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

Air Base and Weapons

JB CHS is situated near the interface of the lower Middle Atlantic Coastal Plain and the Southern Coastal Plain Level III ecoregions. The land area at JB CHS Air is classified as largely Carolina Flatwoods (Level IV ecoregion); the land area at JB CHS Weapons is classified in both the Carolina Flatwoods and Sea Islands/Coastal Marsh (Level IV) ecoregions (Griffith et al., 2002). Carolina Flatwoods are characterized by flat plains on lightly dissected marine terraces with swamps, low gradient streams with sandy and silty substrates, and Carolina bays. Barrier islands, dunes, beaches, lagoons, estuaries, and tidal marshes characterize the Sea Islands/Coastal Marsh ecoregion.

North Auxiliary Airfield

The NAAF is situated in the Southeastern Plains (Level III) ecoregion. The northern part of the installation is classified within the Atlantic Southern Loam Plains (Level IV) ecoregion, characterized by dissected smooth plains and irregular plains; broad interstream divides and mostly gentle side slopes dissected by many small, low to moderate gradient sandy bottomed streams; and Carolina bays (Griffith et al., 2002).

The southern portion of the installation near the North Fork of the Edisto River is classified as Southeastern Floodplains and Low Terraces. This classification is characterized by lands associated with major river floodplains and low terraces; low gradient streams with sandy and silty substrates; and oxbow lakes, ponds, and swamps.

2.3.2 Vegetation

The sections below describe vegetation at each of the three JB CHS facilities. A brief discussion of historic vegetative cover is given. A more extensive and detailed description of existing vegetation follows. Other information, data and plans relevant to vegetation management at JB CHS facilities are referenced as follows:

- The Forest Management Plan for NAAF is given in Chapter 7.8;
- Stand maps for JB CHS Weapons were developed for the WFMP discussed in Chapter 7.9 and Section 15.0 (Associated Plans).
- The Invasive Species Control Plan for JB CHS Air and NAAF is given in Section 15.0;
- Management of T&E plant species and habitats for JB CHS facilities is discussed in Section 7.4;
- Grounds maintenance for JB CHS facilities is discussed further in Section 7.7;
- Forest management for JB CHS facilities is discussed further in Section 7.8;
- Wildland fire management for JB CHS facilities is discussed further in Section 7.9; and

- The integrated pest management program for JB CHS facilities is discussed further in Section 7.11.

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2.3.2.1 Historic Vegetation Cover

Air Base

Although no site specific studies have been conducted to assess the historic vegetation cover at JB CHS Air, cultural resource investigations have concluded that the vegetation cover prior to European settlement was largely pine flatwoods. This fire dependent community is characterized by an open canopy dominated by longleaf pine and scattered pond pine, an open midstory, and an understory comprised of some mixture of wiregrass, cane, herbs, and pocosin shrubs, depending on soil moisture and fire frequency. Following European settlement in the mid-1670s, much of the area was converted to plantation estates, and the land was used to grow timber, cotton, rice, and indigo.

After the Civil War, many phosphate fertilizer plants were constructed in the area. At that time, extensive strip mining for phosphate, both by hand and by machine, flourished within the area between Dorchester Road and the installation and denuded large swaths of land. The results of this mining are still evident in the form of a system of parallel ridges separating ditches or pits. These pits vary from three to 20 feet wide and many are now filled with water. Phosphate mining was taxed out of existence by Governor Ben Tillman in the 1890s. From the 1890s until government land acquisition occurred, the present JB CHS Air site was a combination of small farms, wooded areas, and the ruins of the abandoned phosphate mines.

North Auxiliary Airfield

Historical vegetation information for the NAAF vicinity is not available. However, based upon present landforms, it is likely that the land cover prior to European settlement included a bald cypress-tupelo-gum swamp adjacent to the North Fork of the Edisto River, oak/hickory forest on the sloped terrain, and longleaf pine on the level uplands.

The land in the vicinity of NAAF began to be developed during the 1890s, when a depot was constructed in the nearby town of North on the new South Bound Railroad Company line (Town of North 2012). Much of the land in the vicinity was converted to farmland (primarily cotton) at this time.

Weapons Station

Although no site specific studies have been conducted to assess the historic vegetation cover at JB CHS Weapons, cultural resource investigations have concluded that the vegetation cover prior to European settlement was largely pine flatwoods. As stated above, this fire dependent community is characterized by an open canopy dominated by longleaf pine or pond pine, an open midstory, and an understory comprised of some mixture of wiregrass, cane, herbs, and pocosin shrubs, depending on soil moisture and fire frequency. Following European settlement in the mid-1670s, much of the area was converted to plantation estates, and the land was used to grow timber, cotton, rice, and indigo.

2.3.2.2 Current Vegetation Cover

Air Base

JB CHS Air encompasses 3,733 acres and is largely developed with improved and semi-improved landscaped areas. Development consists of buildings and paved areas, mainly runways and airfields. Semi-improved areas include grassy areas adjacent to roads, taxiways, buildings, and shops and managed vegetation in areas such as power lines and railroad rights-of-ways. Typical grasses in these areas include

common Bermuda, centipede, rye grass, and St. Augustine. Undeveloped areas are mainly mesic hardwoods. A small amount of the Base is in forested pine plantations.

At JB CHS Air, seven vegetative cover types have been identified (Figure 2-10). They are listed below along with the approximate respective percentage of total coverage:

1. Mowed/Airfield (42 percent);
2. Residential/Developed (27 percent);
3. Wetland Forest (9 percent);
4. Golf Course (8 percent);
5. Cut Over-Scrub/Shrub (7 percent);
6. Upland Forest (5 percent); and
7. Tidal Marsh (2 percent).

The ***Mowed/Airfield*** cover type includes all runways, taxiways, airplane parking areas, and the regularly mowed land between and surrounding these features. Vegetation consists of turf and landscaped areas. This is the largest habitat cover type, and is the most important one in terms of potential conflicts between wildlife and Base operations (i.e., BASH events).

The ***Residential/Developed*** cover type includes all developed portions of the Base not located within the airfield area. Vegetation consists of turf and landscaped areas.

Forested wetlands at JB CHS Air are typically dominated by red maple (*Acer rubrum*) and sweetgum (*Liquidambar styraciflua*). More detailed information about wetlands at JB CHS Air can be obtained from the most recent wetland delineation report (Pinnacle, 2003).

The ***Golf Course*** includes turf and landscaped areas. This cover type was delineated because a man-made savannah type habitat (i.e., widely spaced trees with a grassy understory) often attracts bird species that are not found in other areas of the Base.

The ***Cut Over-Scrub/Shrub*** cover type includes those areas that have been cut over and will be maintained in a scrub/shrub condition to comply with Unified Facility Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design for Class B Air Force Runways*. Both wetland and upland areas recently subjected to cutting for this purpose have been included in this cover type.

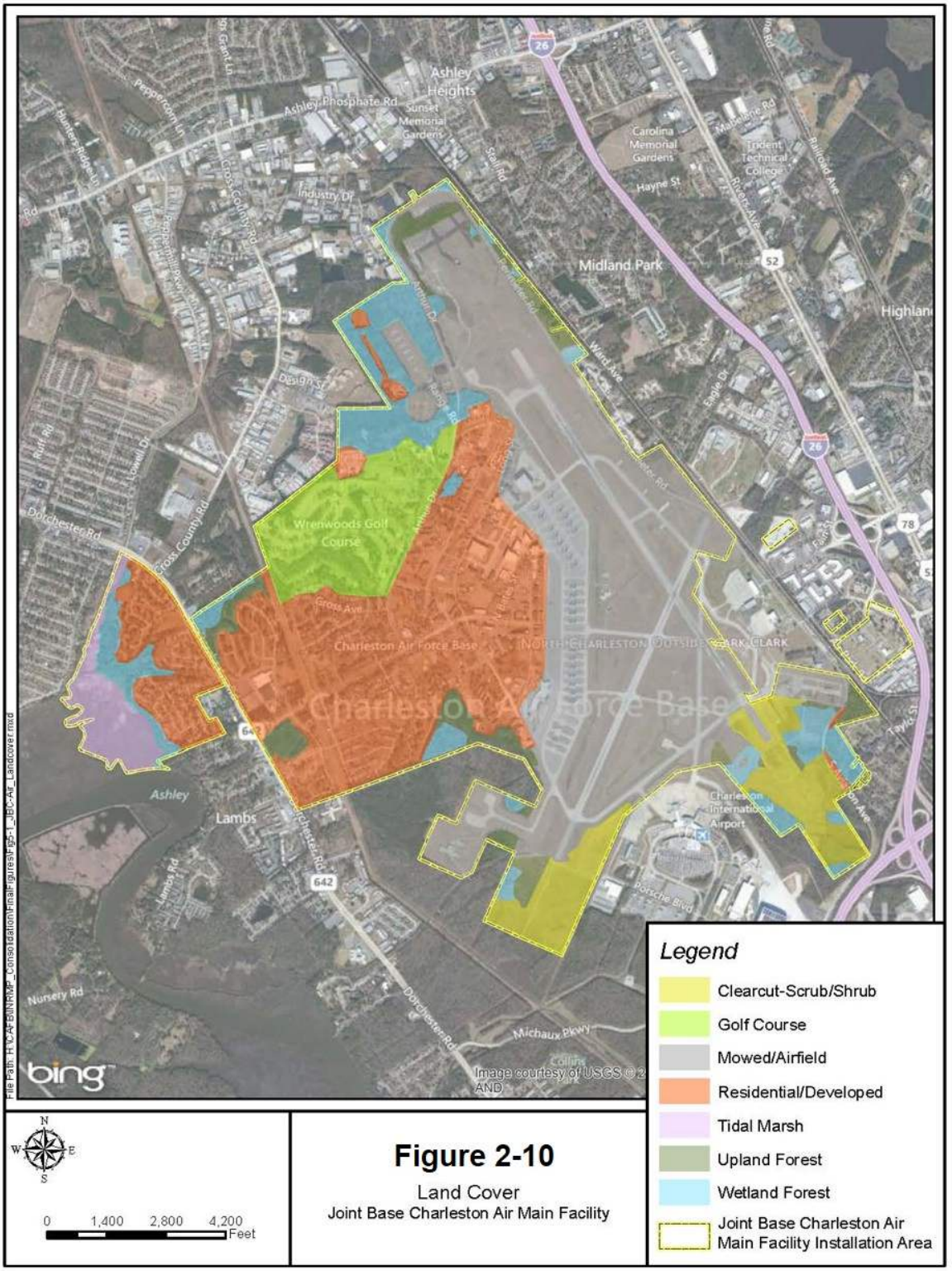


Figure 2-10. Land cover – JB CHS Air Base

The ***Upland Forest*** cover type includes mesic forest stands located throughout the Base. These forests are generally dominated by red maple and sweetgum, with numerous oak species (*Quercus sp.*), loblolly pine (*Pinus taeda*), and longleaf pine (*Pinus pulustris*) also present. Forests at JB CHS Air are typically fairly immature, with tree diameters ranging from six to eight inches at breast height.

The ***Tidal Marsh*** cover type is associated with Ashley River and Popperdam Creek, and is located west of the Hunley Park military housing development. This tidally influenced habitat is part of an extensive marsh complex dominated by smooth cordgrass (*Spartina alterniflora*).

Tables 2-10 and 2-11 list some of the flora identified in wetlands and surrounding uplands at JB CHS Air.

North Auxiliary Airfield

NAAF encompasses approximately 2,392 acres. The predominant natural community at NAAF is the 426-acre bottomland hardwood swamp located in the southern portion of the Airfield. The edge of this forested community is dominated by red maple, sweetbay (*Magnolia virginiana*), and sweetgum. The remainder of the community is dominated by swamp blackgum (*Nyssa sylvatica var biflora*) and water tupelo (*Nyssa aquatica*). Both community areas are characterized by the presence of saplings interspersed with mature specimens. Common understory constituents include wax myrtle (*Myrica cerifera*), redbay (*Persea borbonia*), holly (*llex coriacea*), and sparkleberry (*Vaccinium arboreum*). The herbaceous layer in this wetland is sparse near the river and is dominated by sphagnum moss (*Sphagnum spp.*), sedges (*Carex spp.*), and cinnamon fern (*Osmunda cinnamomea*). The upland forests at NAAF are largely planted and managed for timber production and wildlife habitat. Pine species include slash pine, longleaf pine, and loblolly pine.

At NAAF, five habitat cover types were identified (Figure 2-11). They are listed below along with the approximate respective percentage of total coverage:

1. Mowed/Airfield (37 percent);

2. Hardwood Forest (20 percent);

3. Pine Forest (20 percent);

4. Wetland Forest (18 percent); and

5. Cut Over-Scrub/Shrub (5 percent).

The ***Mowed/Airfield*** cover type includes all runways, taxiways, airplane parking areas, buildings, and the regularly mowed land between and surrounding these features. Vegetation consists of turf and landscaped areas. This is the largest habitat cover type, and is the most important one in terms of potential conflicts between wildlife and base operations (i.e., BASH events).

Numerous oak species, hickories (*Carya spp.*), red maple, and sweetgum dominate the ***Hardwood Forest*** cover type. Loblolly pine is also present, especially near the edge of the Pine Forest habitat cover type.

The ***Pine Forest*** habitat cover type is dominated by loblolly pine, slash pine, longleaf pine, with southern red oak (*Quercus falcata*), sweetgum, and water oak (*Quercus nigra*) as dominant secondary species. Three longleaf pine restoration areas are included in this cover type.

The ***Wetland Forest*** cover type includes forested wetland areas identified during the current jurisdictional wetland delineation (Pinnacle, 2003). Forested wetlands at NAAF are typically dominated by red maple, sweetgum, tulip poplar (*Liriodendron tulipifera*), swamp blackgum (*Nyssa biflora*), and water tupelo.

The ***Cut Over-Scrub/Shrub*** cover type includes those areas that have been cut over and will be maintained in a scrub/shrub condition to comply with UFC 3-260-01, Airfield and Heliport Planning and Design for Class B Air Force runways.

Table 2-10. Trees and shrubs at JB CHS Air Base

Common Name	Scientific Name
Arrowwood	*Viburnum dentatum*
Bay, Red	*Persea borbonia*
Beech, American	*Fagus grandifolia*
Birch, River	*Betula nigra*
Button-bush, Common	*Cephalanthus occidentalis*
Catalpa, Southern	*Catalpa bignonioides*
Cedar, Eastern Red	*Juniperus virginiana*
Cherry	*Prunus serotina*
Chinese Tallow-Tree	*Sapium sebiferum*
Devil's Walking stick	*Aralia spinosa*
Dogwood, Flowering	*Cornus florida*
Elm, Cedar	*Ulmus crassifolia*
Sweetgum	*Liquidambar styraciflua*
Hackberry	*Celtis occidentalis*
Hawthorne	*Crataegus sp.*
Hickory, Mockernut	*Carya tomentosa*
Holly, American	*Ilex opaca*
Holly, Yaupon	*Ilex vomitoria*
Hornbeam, American /Blue-beech	*Carpinus caroliniana*
Ligustrum	*Ligustrum sinense*
Magnolia, Southern	*Magnolia grandiflora*
Maple, Box Elder	*Acer negundo*
Maple, Red	*Acer rubrum*

Common Name	Scientific Name
Mulberry, Red	*Morus rubra*
Oak, Laurel	*Quercus laurifolia*
Oak, Live	*Quercus virginiana*
Oak, Southern Red	*Quercus falcata*
Oak, Swamp Chestnut	*Quercus prinus*
Oak, Water	*Quercus nigra*
Palmetto, Dwarf	*Sabal minor*
Pecan	*Carya illinoensis*
Persimmon, Common	*Diospyros virginiana*
Pine, Loblolly	*Pinus taeda*
Pine, Longleaf	*Pinus palustris*
Plum	*Prunus angustifolia*
Poplar, Yellow	*Liriodendron tulipifera*
Sassafras, Common	*Sassafras albidum*
Spanish Dagger	*Yucca filamentosa*
Spice-bush, Common	*Lindera benzoin*
Sumac, Smooth	*Rhus glabra*
Sycamore	*Plantanus occidentalis*
Tupelo, Black/Blackgum	*Nyssa sylvatica*
Wax Myrtle	*Myrica cerifera*
Willow	*Salix nigra*

.

Table 2-11. Smaller shrubs and ground cover at JB CHS Air Base

Common Name	Scientific Name
Pepper Vine	*Ampelopsis arborea*
Muscadine Grape	*Vitis rotundifolia*
Carolina Jessamine	*Gelsemium sempervirens*
Sourwood	*Oxydendrum arboreum*
Common Deerberry	*Vaccinium stamineum*
Japanese honeysuckle	*Lonicera japonica*
Cat Greenbriar	*Smilax glauca*
Saw Greenbriar	*Smilax bona-nox*
Southern Dewberry	*Rubus trivialis*
Poison Ivy	*Toxidendron radicans*
Summersweet Clethra	*Clethra alnifolia*
Fern, Cinnamon	*Osmunda cinnamomea*
Fern, Royal	*Osmunda regalis*
Fern, Chain	*Woodwardia virginica*
Fern, Chain	*Woodwardia areolata*
Lizard’s tail	*Saururus cernuus*

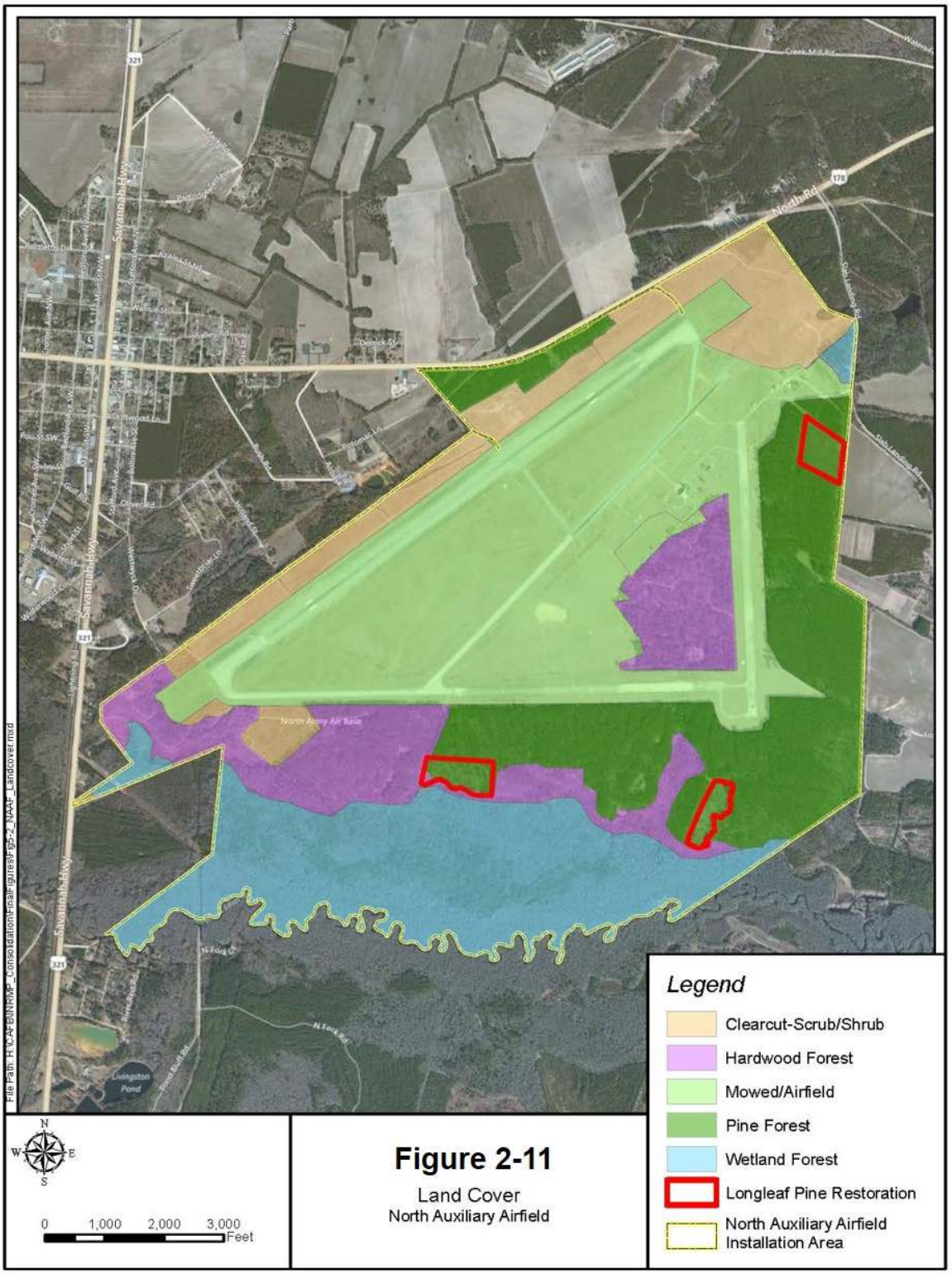


Figure 2-11. Land cover – North Auxiliary Airfield

Weapons Station

JB CHS Weapons has 18,735 acres under its control through fee simple ownership, easement, or lease. Seven habitat cover types have been identified andlisted below (Figure 2-12 provides a coarse depiction of habitat cover types at JB CHS Weapons):

1. Improved/Semi-improved;
2. Upland Pine Forest;
3. Upland Pine/Hardwood Forest;
4. Wetland Forest;
5. Wetland Scrub/Shrub;
6. Wetland Emergent; and
7. Open Water.

Vegetative communities at JB CHS Weapons can be largely divided into two broad categories: uplands and wetlands (including open water areas). Within these categories are numerous habitat types and plant communities. The following descriptions of vegetation at JB CHS Weapons are based on a classification scheme recommended and utilized by the South Carolina Heritage Trust Program (Nelson, 1992).

Uplands

Part of the upland acreage at JB CHS Weapons consists of improved (urban/disturbed) and semi-improved (maintained/successional) areas. Improved grounds are those areas that receive intensive horticultural development and maintenance. Semi-improved acres are grounds that receive less intensive development and maintenance.

Urban/Disturbed. Communities identified as Urban/Disturbed support residential, commercial, and industrial development. These communities are characterized by a variety of landscape grasses and shrubs such as sea myrtle (*Baccharis angustifolia*) and waxmyrtle, supplemented by native pine and hardwood trees.

Maintained/Successional. Maintained/Successional communities occur along utility line corridors and road shoulders where periodic maintenance (mowing, disking, or burning) is performed. These systems are characterized by a number of perennial species including broomsedge (*Andropogon virginicus*), goldenrod (*Solidago spp.*), aster (*Aster spp.*), ragweed (*Ambrosia artemisiifolia*), dogfennel (*Eupatorium capillifolium*), blackberry (*Rubus sp.*), and a variety of grasses. The invasive exotic Japanese honeysuckle is also a common component of this community. On saturated or inundated sites, soft rush (*Juncus effusus*), bulrush (*Scirpus cyperinus*), common cattail (*Typha latifolia*), and other hydric species are present.

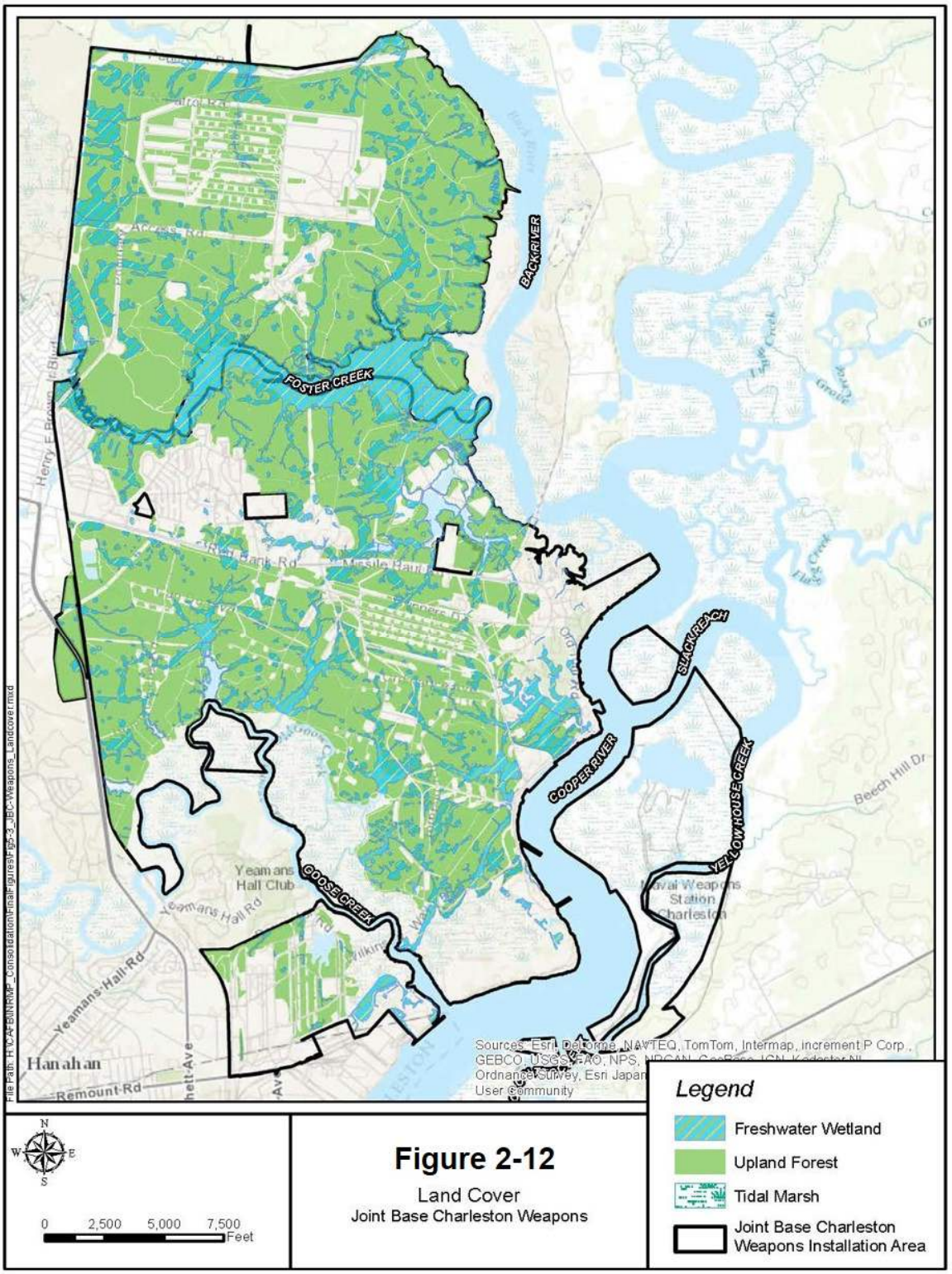


Figure 2-12. Land cover – Joint Base Charleston Weapons

Pine Flatwoods. Pine flatwoods are prominent in the upland and better-drained areas of Joint Base Charleston Weapons. Loblolly pine and/or longleaf pine dominate these areas with occasional pond pine (*Pinus serotina*) where seasonal inundation or saturated soils occur. In some areas, hardwood species such as sweetgum, red maple, water oak, and willow oak (*Q. phellos*) occasionally reach canopy height, but mostly exist as understory trees along with waxmyrtle, dogwood (*Cornus florida*) and American holly (*Ilex opaca*). In areas where mesic conditions prevail, red bay and sweet bay may also be found in the forest understory. Ground cover and shrub layer vegetation are variable and dependent upon the hydrological regime and degree of canopy closure. Typical species include, swamp sweetbells (*Leucothoe racemosa*), sweet pepper bush (*Clethra alnifolia*), bracken fern (*Pteridium aquilinum*), blackberry (*Rubus* spp.), and green brier (*Smilax* spp.). Invasive exotic species such as Japanese honeysuckle and privet (*Ligustrum sinense*) are common in this community type.

Several stands with significant longleaf pine componets are of special significance. Longleaf pine forests type once dominated the southeastern Coastal Plain occupying approximately 60 million acres. Today, less than four million acres are left. The remaining longleaf pine/wiregrass ecosystems have become focal points of interest, and are receiving increased research and management attention. As the longleaf forest on private land continues to shrink, stands such as the ones on this installation will have increased importance.

Pine Savannah. Pine savannah communities at JB CHS Weapons are characterized by scattered mature loblolly and longleaf pine that withstood Hurricane Hugo, along with grasses, ferns, and scattered saplings. Young growth of loblolly pine seedlings with scattered longleaf seedlings are prevalent.

Pine/Mixed Hardwood Forest. Loblolly pine, sweetgum, water oak, red maple, and occasional longleaf pine typically dominate Pine/Mixed hardwood forests at Joint Base Charleston Weapons. On slightly drier sites, scattered live oak (*Q. virginiana*), southern red oak (*Q. falcata*), blackjack oak (*Q. marilandica*), and post oak (*Q. stellata*) are present in the overstory. Understory composition is similar to older pine woodlands, and also includes holly, wax myrtle, dogwood, sweetleaf (*Symplocus tinctoria*), and young canopy saplings. Switchcane (*Arundinaria gigantea*), greenbrier (*Smilax, sp.*), the invasive exotic Japanese honeysuckle, and a variety of ferns, herbacious species, and grasses occur sporadically throughout the herb layer.

Wetlands

Wetlands at JB CHS Weapons are largely tidal and non-tidal emergent systems. Also present are wetland forest, scrub/shrub, and open water habitats. Wetland vegetation for these community types is described further in Section 2.35.

2.3.2.3 Future Vegetation Cover

Projected climate scenarios may influence the future vegetation associations within and surrounding JBCHS. A climate change assessment summary for JBCHS is provided in Appendix 14.2. The results of this assessment suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario and a high emission scenario. The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data through the year 2050. The dominant ecosystems present at JBCHS are wetland forests and upland/pine forests. Slight changes in temperature and precipitation can substantially alter the composition, distribution, and abundance of species in these ecosystems, and the products and services they provide. As warmer temperatures increase evaporation and water use by plants, soils are likely to continue to become drier. Average rainfall is likely to decrease during winter, spring, and summer. Increased evaporation and

decreased rainfall are both likely to reduce the average flow of rivers and streams. Drier soils will increase the need for irrigation, but sufficient water might not be available (EPA, 2016).

In general, forested wetland areas are susceptible to climate change. There is a temperature below which the equilibrium state of the ecosystem appears constant, but above which the equilibrium of this vegetation cover declines steadily. Wetland ecosystems will face increases in air and surface water temperatures, alterations in the magnitude and seasonality of precipitation and run-off, and shifts in reproductive phenology and distribution of plants and animals. These ecosystems are naturally resilient, provide linear ecosystem connectivity, link aquatic and terrestrial ecosystems, and create thermal refugia for wildlife: all characteristics that can contribute to ecological adaptation to climate change (Association of State Wetland Managers, n.d.). Because wetland systems and the projected impacts of climate change are highly variable geographically, there is a pressing need to develop a place-based understanding of climate change threats to these ecosystems.

2.3.2.4 Turf and Landscaped Areas

Communities identified as Urban/Disturbed support residential, commercial, and industrial development. These communities are characterized by a variety of landscape, warm season grasses and shrubs such as sea myrtle (*Baccharis angustifolia*) and waxmyrtle, supplemented by native pine and hardwood trees.

2.3.3 Fish and Wildlife

Wildlife resource survey updates were completed for JB CHS Air (including NAAF) in 2011. This 2011 report include updates to the 2005 baseline wildlife survey and deer census (North Wind, 2005). A survey of rare, threatened and endangered amphibian and reptiles was conducted on JB CHS Weapons Station in 1995 and a small mammal survey conducted 2001. A multi-year neotropical migratory bird survey on JB CHS Weapons was completed in 2006 and a Migratory Bird Plan in 2011. In 2018 a bat acoustic survey was completed for JBC Air and Weapons. Results of wildlife surveys are summarized below with complete reports in Appendix 14.2. Fish and wildlife management for JB CHS is discussed in Section 7.2.

2.3.3.1 Air Base

Wildlife Surveys

Wildlife at JB CHS Air is primarily restricted to those species adapted to suburban and urban environments. The Main Base and Hunley Park housing areas at JB CHS Air have a suburban environment that primarily consists of maintained lawns, landscaping vegetation, and scattered trees. Park-like habitat exists within the Main Base Exchange and Hunley Park North areas, which no longer contain houses. Small areas of upland forest and freshwater wetland also exist in and around the housing areas. The wetlands are all forested systems that exist primarily along the perimeter of the housing areas.Wildlife abundance and species diversity is highest in and around the upland forest and wetland systems. Drainage ditches in the housing areas are also utilized as habitat by some species.

There are no suitable sites for hunting and fishing at JB CHS Air due to its small size and urban setting, although a fishing dock in the Ashley River at the Hunley Park housing area is worthy of future consideration. Game species present include bobwhite quail (*Colinus virginiana*), mourning dove (*Zenaida macroura*), cottontail rabbit (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), and white-tailed deer (*Odocoileus virginianus*).

During the wildlife survey update at JB CHS Air, 58 bird species, five species of amphibians, six reptile species, and five mammal species were identified. Ten of the species identified were not included in the baseline wildlife survey findings (North Wind 2005). A complete listing of species observed during the

recent survey and the 2005 baseline survey is provided in the *Wildlife Survey and Deer Census Update* for JBC (North Wind, 2011a; Appendix 14.2). The distribution of these species within each habitat cover type is shown in Table 2-12 and summarized below.

Table 2-12. Summary of wildlife species identified on Joint Base Charleston-Air (2010-2011).

Animal Class	Mowed/ Airfield	Clearcut-Scrub/Shrub	Wetland Forest	Upland Forest	Golf Course	Residential/ Developed	Tidal Marsh
Birds	11	26	6	26	21	15	6
Amphibians	–	5	2	–	–	1	–
Reptiles	1	2	1	2	2	2	–
Mammals	–	4	1	2	2	3	–

The ***Mowed/Airfield*** area was the single largest habitat cover type (accounting for 42 percent of the area at JB CHS Air). Wildlife deterrents (i.e., pyrotechnics, depredation) are carried out within this habitat for the safety of those carrying out vital missions at the Base. Eleven animal species were identified in the Mowed/Airfield area, and one (the eastern meadowlark) was identified only in that habitat.

The ***Cut Over-Scrub/Shrub*** habitat cover type accounted for the greatest species diversity at JB CHS Air, with 37 identified species (13 of which were identified only there). While somewhat surprising initially, because this habitat cover type accounts for only seven percent of the acreage at JB CHS Air, it is the most diverse in some respects. The range of dominant vegetation extends from oak, hickory, red maple, and sweetgum regeneration in upland portions to cattails (*Typha sp*.), lizard tail (*Saururus cernuus*), and pickerelweed (*Pontederia cordata*) in the wettest portions at the ends of Runways 03 and 33.

Ten species were identified in the ***Wetland Forest***. None of these species were unique to that habitat. Thirty species were identified in the ***Upland Forest***, nine of which were unique to that habitat.

Twenty-five species were confirmed on the ***Golf Course***. Two species (the red-bellied and pileated woodpeckers) were found only on the Golf Course.

Twenty-one species were identified in the ***Residential/Developed*** habitat cover type (four of those were unique to that habitat).

Six species (all birds) were identified in the ***Tidal Marsh*** habitat. One of these (the marsh wren) was found only in that habitat.

Deer Census

Currently, the statewide deer population in South Carolina is estimated at 715,000, or one deer per 26 acres, and has been declining since the 1990's (Ruth, 2011). In 2008, the SCDNR estimated the density in the vicinity of JB CHS Air to be between 15-30 deer per square mile, or one deer per 21-42 acres.

As part of a Hazard Assessment for BASH risk, USDA-APHIS has been conducting night-time deer surveys at JB CHS Air using a forward looking infrared (FLIR) scope. Between October 2010 and July 2011, the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) wildlife biologists conducted 15 deer surveys using the same general census route and spotted an average of 15 deer (the range was between five and 29 deer). Based on these surveys, the deer density at JB CHS Air is estimated at approximately one deer per 15 acres. However, the variability in the number of deer

spotted over the 10-month survey period indicates that accurately quantifying the resident deer population is nearly impossible without more rigorous census methods. The difficulty of this task is further exacerbated by deer depredation at JB CHS Air, which directly affects the number of deer and possibly indirectly affects deer behavior at the installation. The USDA-APHIS data shows a decrease in deer sightings following the March 2011 depredation, during which eight deer were harvested (USDA, 2011).

In 2011, additional deer surveys were conducted to help determine the amount of depredation required to ensure flightline safety (North Wind, 2011a). During the two census periods, an average of 5.5 deer were spotted (six on May 25 and five on May 26). Based on this limited sample, the deer density at JB CHS Air is estimated at approximately one deer per 45 acres. Extrapolated to the entire acreage at JB CHS Air, the resident deer population would be estimated at approximately 88 deer. Notwithstanding the small data set, this number is likely high, because the total acreage of JB CHS Air includes wide variability in suitable habitat for deer.

2.3.3.2 North Auxiliary Airfield

Wildlife Surveys

A complete listing of species observed during the 2011survey update and the 2005 baseline survey is provided in the *Wildlife Survey and Deer Census Update* for JBC (North Wind, 2011a). During the 2011 wildlife surveys at NAAF, 79 bird, one amphibian, four reptiles, and seven mammal species were identified. Of these, 32 were not identified during the baseline survey (North Wind, 2005). The distribution of these species within each habitat cover type is provided in Table 2-13. Amphibian numbers were lower during this survey effort than during the 2005 baseline survey because the pond that was identified as a herpetofauna concentration site during the 2005 survey was dry during the entire spring breeding season.

Table 2-13. Summary of wildlife species identified on North Auxiliary Air Field (2010-2011)

Animal Class	Mowed/ Airfield	Clearcut-Scrub/Shrub	Wetland Forest	Pine Forest	Hardwood Forest
Birds	23	35	16	15	32
Amphibians	–	–	1	–	–
Reptiles	–	–	3	–	1
Mammals	2	3	3	3	3

The ***Mowed/Airfield*** area was the single largest habitat cover type, accounting for 37 percent of the area at NAAF. The lack of varied habitat in this cover type is intended to deter the presence of wildlife for the safety of personnel carrying out vital missions at the airfield. Despite the monotypic (Bahia grass) cover in the Mowed/Airfield area, 25 species were identified in this habitat. The red-tailed hawk, wild turkey, northern bobwhite, chuck-will's widow, eastern meadowlark, fish crow, horned lark, barn swallow, merlin, great blue heron, cattle egret, Canada goose, bald eagle, and northern harrier were identified only in this habitat.

The ***Cut Over-Scrub/Shrub*** habitat cover type accounted for the greatest species diversity at NAAF, with 38 identified species, although it accounts for only five percent of the total acreage. Species identified only in this habitat cover type included the eastern kingbird, northern mockingbird, yellow-throated warbler, prairie warbler, yellow-breasted chat, indigo bunting, painted bunting, cedar waxwing, American goldfinch, osprey, and wood stork (two wood storks were identified soaring adjacent to the airfield).

Twenty-three species were identified in the ***Wetland Forest*** habitat, which is largely contained within the large wetland in the southern portion of NAAF. Acadian flycatcher, white-and red-eyed vireos, prothonotary warbler, ovenbird, Wilson's snipe, raccoon, opossum, three-lined salamander, scarlet snake, ringneck snake, and copperhead snake were identified only in this habitat.

A total of 18 species were identified in the ***Pine Forest*** habitat cover type. Of these, the northern flicker, pine warbler, pine siskin, summer tanager, and the brown-headed nuthatch were found only in this habitat cover type.

Thirty-six species were identified in the ***Hardwood Forest*** habitat cover type. The brown-headed cowbird, Louisiana waterthrush, black-and-white warbler, yellow-throated vireo, white-breasted nuthatch, red-bellied woodpecker, yellow-bellied sapsucker, dark-eyed junco, Carolina chickadee, ruby-throated hummingbird,and ground skink were identified only in this habitat.

Deer Census

In 2008, the SCDNR estimated the density of deer in the vicinity of NAAF to be between 30-45 deer per square mile, or one deer per 14-21 acres.

As part of their Hazard Assessment for BASH risk, USDA-APHIS has also been conducting night time deer surveys at NAAF using a FLIR scope. Between October 2010 and July 2011, USDA-APHIS wildlife biologists conducted 17 deer surveys using the same general census route, and spotted an average of 16 deer (the range was between two and 29 deer). Based on these surveys, the deer density at NAAF is approximately one deer per 75 acres, or a total population of 32 deer. Similar to JB CHS Air, the variability in the number of deer spotted over the 10-month survey period indicates that quantifying the resident deer population is nearly impossible at this level of census and that the difficulty of the task is exacerbated by deer depredation and the behavior changes it may be causing that could affect census counts. Thirty-five deer were depredated at NAAF between December 2010 and May 2011.

During the two recent census periods in 2011, an average of 8.5 deer were spotted (10 on May 23 and seven on May 24), for a deer density of approximately one deer per 141 acres (North Wind, 2011a).

2.3.3.3 Weapons Station

A large number of both game and non-game fish and wildlife species are dependent on the diverse habitats found on JB CHS Weapons. These species have adapted to the radically altered habitat that resulted from Hurricane Hugo in 1989. Non-game species include many different types of birds, amphibians, and reptiles. Game species include deer, rabbit, and many different species of waterfowl. Species adapted to mature, open woods such as wild turkey, fox squirrel, and Bachman's sparrow, that appeared to have declined sharply after the hurricane seem to have rebounded, according to the latest surveys (Appendix 14.2). Species such as gray squirrel and white-tailed deer that heavily depend on acorns in winter months, continue to show varying degrees of decline. Small game animals such as bobwhite quail, raccoons,cottontail rabbits, foxes, and bobcats, have all adapted to early successional stages. Coyotes, armadillos and beavers have all established populations on base in the past decade.

JB CHS Weapons also provides habitat for a large number of resident and migratory bird species, including neotropical migratory birds. A wide variety of birds thrive on the Installation including sizable populations of raptors, shore birds, wading birds, perching birds, and waterfowl. From 2000 to 2006, JB CHS Weapons conducted surveys to inventory bird species using the Installation, identify priority bird species and their habitats for future management, and establish a baseline for long term monitoring. Bird species observed at JB CHS Weapons are listed in the migratory bird survey (Appendix 14.2).

The numerous lakes and streams and the river support many species of fish at JB CHS Weapons. Most prominent of these species are those in the sunfish, bass, and catfish families. The adjacent Cooper River is a transition zone between fresh and salt water. Consequently, a diversity of fish exist here and anglers can catch saltwater species, including winter trout, flounder, drum, and croaker.

2.3.4 Threatened and Endangered Species and Species of Concern

Section 7 (a) (2) of the Endangered Species Act (ESA) of 1973, as amended (15 USC 1531 et seq.) provides that: "Each Federal agency shall, in consultation with and with the assistance of the Secretary (Interior), insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available."

JB CHS Air and NAAF were surveyed for federally listed T&E species and Species of Concern in 1993 (S&ME, 1993), 1997 (REI, 1997), 2003 (Pinnacle, 2003), and 2011 (North Wind, 2011c).

Surveys for JB CHS Weapons include:

- 1987 and 1993 - Rare plant species surveys conducted to assess the biological change following Hurricane Hugo;
- 1994 - Rare, T&E amphibians and reptiles survey conducted by SCDNR; and
- 2000 - Red-Cockaded Woodpecker (RCW) Survey.
- 2018 – Bat Acoustic Survey conducted by Center for Integrated Research on the Environment

The latest T&E survey information for JB CHS Air facilities is given in Appendix 14.2. Management of T&E species and habitats is discussed in Section 7.5.

2.3.4.1 Air Base

The following sections summarize rare species survey results for flora and fauna at JB CHS Air.

2.3.4.1.1 Flora

No federally listed T&E plant species, no plant species of concern, and no suitable habitat for such species, were identified at JB CHS Air during the 2011 rare species survey. South Carolina does not have a state list of T&E plant species; therefore, there are no state listed T&E or special concern plant species at JB CHS Air.

2.3.4.1.2 Fauna

Federally Listed Threatened or Endangered Animal Species

No T&E animal species were identified at JB CHS Air during earlier rare species surveys. Similarly, no federally listed T&E animal species, nor suitable habitat for such species, were located during the 2011 rare species survey at JB CHS Air. However, wood storks (*Mycteria americana*, a state endangered and federally threatened species) have been observed on the installation occasionally over the past decade (North Wind, 2011c). These sightings have been single individuals and groups feeding in roadside ditches along Perimeter Road in the northern portion of the Base or in base freshwater impoundments. No roosting habitat for wood stork is present at JB CHS Air, and the nearest known nesting colony is located approximately five miles north of JB CHS Air.

Federal Species of Concern Animals

Painted buntings (*Passerina ciris*, a federal species of concern) were identified at JB CHS Air during the 1997 rare species survey (REI, 1997). During the 2003 survey, painted buntings were again sighted (Pinnacle, 2003). During the wildlife survey in 2005, painted bunting and loggerhead shrike (*Lanius ludovicianus*, also a Federal species of concern) were identified at JB CHS Air.

During the 2011 survey, painted bunting and loggerhead shrike were identified in two locations at JB CHS Air. Two male painted buntings were identified at two locations. One female painted bunting was observed in the vicinity of the singing male southwest of Runway 03, but no nesting activity was observed. The locations of the painted buntings and identified suitable habitat are shown on Figure 3 of the 2011 rare species survey found in Appendix 14.2.

A family unit of loggerhead shrikes (two adults and two recently fledged young) was identified in 2011 near the fuel tank farm north of the northern terminus of Davis Drive. In addition to the family unit, two adult loggerhead shrikes were identified along North Bates Street. The locations of the loggerhead shrike sightings and identified suitable habitat are shown on Figure 4 of the 2011 rare species survey found in Appendix 14.2. No nesting activity was observed.

State Listed Threatened, Endangered, or Species of Concern Animals

A single bald eagle (*Haliaeetus leucocephalus*, a state-threatened species) was observed once on JB CHS Air during the most recent survey (North Wind, 2011c). No nests were observed during the survey.

Animals Identified as South Carolina Priority Species

Nine species that are included in the South Carolina Priority Species list were identified at JB CHS Air during the 2011 survey. Of these, six were Highest Priority, one was High Priority, and two were Moderate Priority (Table 2-14).

Table 2-14. South Carolina priority species identified at JB CHS Air Base

Class	Highest Priority	High Priority	Moderate Priority
Mammals	--	--	--
Birds	Little Blue Heron (*Egretta caerulea)* Loggerhead Shrike (*Lanius ludovicianus*)	Bald Eagle (*Haliaeetus leucocephalus)* Great Egret (*Ardea alba*)	Great Blue Heron (*Ardea herodias)* Brown-headed Nuthatch

Class	Highest Priority	High Priority	Moderate Priority
	Painted Bunting (*Passerina ciris)*	Eastern Meadowlark (*Sturnella magna)*	(*Sitta pusilla*) Snowy Egret *(Egretta thula)*
Reptiles and Amphibians	--	--	--
Source: SCDNR 2014, North Wind 2011c.			

2.3.4.2 North Auxiliary Airfield

The following sections summarize rare species survey results for flora and fauna at NAAF.

2.3.4.2.1 Flora

Federally Listed Threatened or Endangered Plant Species

There are no state or federally listed T&E species or critical habitats known on NAAF. No T&E plant species were identified during earlier rare species surveys. Similarly, no federally listed T&E plant species, nor suitable habitat for such species, were located during the 2011 survey.

Federal Species of Concern Plants

Carolina birds-in-a-nest (*Macbridea caroliniana*, a Federal species of concern plant) was first identified at NAAF in 1997, when "several hundred specimens" were observed (REI, 1997). During the 2011 survey, this species was identified in the wetland forest at NAAF. Three small populations (ranging from three to 20 stems) were identified in the southeast portion of the installation. It was not found during the 2003 survey because most of the suitable habitat was inundated. Suitable habitat for this species is identified in Figure 6 of the 2011 rare species survey found in Appendix 14.2.

State Listed Threatened, Endangered, or Species of Concern Plants

South Carolina does not have a state list of T&E plant species; therefore, there are no state listed T&E or special concern plant speciesat NAAF.

2.3.4.2.2 Fauna

Federally Listed Threatened or Endangered Animal Species

No federally listed T&E or species of concern animals were located at NAFF during the 2011 survey. However, two wood storks were observed soaring over the southeastern portion of NAAF (North Wind, 2011c). The 2018 acoustic bat survey manually confirmed that presence of Rafinesque's big-eared Bat, a state listed threatened species.

Suitable habitat for the federally endangered RCW (*Picoides borealis*) was identified within two pine stands at NAAF during the 2003and 2011surveys. However, no sightings or cavity trees were identified within the stands or within a 0.5-mile radius of the stands (see Figure 7 in the 2011 rare species survey located in Appendix 14.2). The suitable habitat for RCW is dominated by slash pine and loblolly pine, with a component of longleaf pine. The larger pines in these stands are likely 60-70 years old, and have a diameter at breast height (DBH) of approximately 20-30 inches.

Federal Species of Concern Animals

Painted bunting and loggerhead shrikewere identified during the 2005 wildlife survey at NAAF (North Wind, 2005). A male painted bunting was identified at NAAF during the 2011 survey (see Figure 9, 2011 rare species survey, Appendix 14.2). The individual was identified in the same location as in the 2005 survey. No female specimens were observed. Suitable habitat for loggerhead shrike was identified within the property during the 2011 survey (see Figure 8, 2011 rare species survey, Appendix 14.2), although the species was not identified during the surveys.

State Listed Threatened, Endangered, or Special Concern Animal Species

A single bald eagle (*Haliaeetus leucocephalus*, a state-threatened species) was observed once on NAAF during the most recent survey. No nests were observed during the survey. The 2018 acoustic bat survey manually confirmed the presence of Rafinesque's big-eared bat, a state listed threatened species.

Animals Identified as South Carolina Priority Species

Seventeen species that are included in the South Carolina Priority Species list were identified at NAAF during the 2011 survey. Of these, 11 were Highest Priority, two were High Priority, and four were Moderate Priority (Table 2-15).

Table 2-15. South Carolina priority species identified at North Auxiliary Air Field

Taxa	Highest Priority	High Priority	Moderate Priority
Mammals	--	--	Eastern Fox Squirrel (*Sciurus niger)*
Birds	American Kestrel (*Falco sparverius)* Northern Bobwhite (*Colinus virginianus)* Painted Bunting (*Passerina ciris*) Wilson's Snipe (*Gallinago delicata)* Wood Stork (*Mycteria americana*) Wood Thrush (*Hylocichla mustelina)*	Acadian Flycatcher (*Empidonax virescens)* Bald Eagle (*Haliaeetus leucocephalus*) Eastern Meadowlark (*Sturnella magna*) Eastern Wood Peewee (*Contopus virens*) Field Sparrow (*Spizella pusilla*) Louisiana Waterthrush (*Parkesia motacilla*) Prairie Warbler (*Dendroica discolor*)	Dark-eyed Junco (*Junco hyemalis)* Great Blue Heron (*Ardea herodias*) Brown-headed Nuthatch (*Sitta pusilla*)
Reptiles and Amphibians	Flatwoods Salamander (*Ambystoma cingulatum*)	--	--
Plants		Carolina Birds-in-a-Nest (*Macbridea caroliniana*)	
Source: SCDNR 2014, North Wind 2011c			

2.3.4.3 Weapons Station

Table 2-16 provides a list of Federal and State listed T&E species that occur, or have the potential to occur on JB CHS Weapons.

Rare and T&E plant surveys were conducted at JB CHS Weapons in 1987 and then again in 1993 to assess the biological change after Hurricane Hugo. No T&E plant species were found on the installation during either of these surveys. A few rare or uncommon species were observed (Appendix 14.2).

The SCDNR conducted a rare and T&E amphibians and reptiles survey on JB CHS Weapons in 1994. No state or federal T&E species were identified during that survey. Over the years, several state species of concern reptiles have been documented to occur on the Installation (Appendix 14.2).

A mammal survey, included in Appendix 14.2, was conducted at JB CHS Weapons in 2001 by SCDNR. One Southeastern myotis (*Myotis austroriparius*, a state threatened species of bat), was captured during the survey. The eastern woodrat (*Neotoma floridana*) and the fox squirrel (*Sciurus niger*), both state species of concern, were also identified during the survey. The 2018 acoustic bat survey manually confirmed the presence of Rafinesque's big-eared bat, a state listed threatened species.

An RCW study, included in Appendix 14.2 was conducted in 2000 at JB CHS Weapons to survey, monitor, and manage historical RCW forest stands using methodologies provided in the RCW Management Plan, and to provide status of RCW activity and cluster potential. Only one male RCW was located and banded during the survey and no mating or nesting activities were observed.

Table 2-16. Federal and State Listed Threatened and Endangered Species that occur or potentially occur on Joint Base Charleston Weapons.

Species		Status	
Common Name	**Scientific Name**	**Federal**	**State**
Reptiles & Amphibians:			
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	T	E
American Alligator	*Alligator mississippiensis*	T*	T*
Dwarf Siren	*Pseudobranchus striatus*		T
Birds:			
Wood Stork	*Mycteria americana*	T	E
Bald Eagle	*Haliaeetus leucocephalus*		T
Swallow-Tailed Kite	*Elanoides forficatus*	SC	E
Red-Cockaded Woodpecker	*Picoides borealis*	E	E
Least Tern	*Sterna antillarum*		T
Wilson's Plover	*Charadrius wilsonia*		T
Mammals:			

Species		Status	
Common Name	**Scientific Name**	**Federal**	**State**
West Indian Manatee	*Trichechus manatus*	T	
Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	SC	E
Southeastern Myotis	*Myotis austroriparius*	SC	
Fish:			
*Atlantic sturgeon	*Acipenser ozyrinchus*	E	
*Shortnose Sturgeon	*Acipenser brevirostrum*	E	E
Plants:			
Canby's Dropwort	*Oxypolis canby*	E	
Pondberry	*Lindera melissifolia*	E	
American Chaff-Seed	*Schwalbea americana*	E	
SC = Species of Concern		T = Threatened	
E = Endangered		T* = Threatened by similarity of appearance	
Federal = Federally listed under the Endangered Species Act			
State = State listed by South Carolina Department of Natural Resources			
*Fish are under the jurisdiction of the National Marine Fisheries Service (NMFS).			

2.3.5 Wetlands and Floodplains

Wetland communities provide valuable habitat for a wide variety of fish and wildlife species. These areas generally represent transitions from upland habitat to open water and are characterized by complex physical, chemical, and biological interactions. The wetlands at JB CHS serve many important functions, including floodwater attenuation, groundwater recharge, and wildlife habitat, among others. Floodwater attenuation is of greatest direct benefit at those wetlands nearest buildings, roads, and runways.

Wetlands surveys have been conducted on JB CHS Air in 1993, 1997, and 2003. Similar surveys for JB CHS Weapons were conducted prior to the 2003 INRMP. The latest wetland survey information is given in the Wetland Protection Plan provided in Section 15.0. Wetland management and protection for JB CHS facilities is discussed in Section 7.6. Wetlands at JB CHS facilities are described below.

2.3.5.1 Air Base

In 1993, approximately 288 acres of wetlands were mapped on the Base at JB CHS Air. In 1997, additional wetlands were identified in the Hunley Park area (this area was acquired by JB CHS after the 1997 survey). The most recent wetland delineations and identification of Waters of the U.S. at JB CHS Air was conducted in 2003 (Pinnacle, 2003). A total of 30 wetlands totaling 354 acres were identified and delineated at JB CHS (Figure 2-5). All of the wetlands at JB CHS Air have been at least moderately disturbed by logging, minor fill at the wetland/upland boundary, ditching, and/or historic phosphate strip mining.

2.3.5.2 North Auxiliary Airfield

The most recent wetland delineations and identification of Waters of the U.S. at NAAF was conducted in 2003 (Pinnacle, 2003). Four wetland areas totaling 431 acres were identified (Figure 2-7).

Virtually all of the wetland acreage (approximately 427 acres of the 431 total wetland acreage) at NAAF is included in the bottomland hardwood forested floodplain that is associated with the North Fork of the Edisto River. This wetland extends the entire length of the NAAF southern boundary.

2.3.5.3 Weapons Station

The coastal/riverine location of JB CHS Weapons results in an association of salt, brackish, and freshwater marshes and wetlands. Wetland and aquatic habitat types include forested wetlands, non-forested wetlands, and open water. These habitats range from large expanses of tidal saltmarsh to small isolated forested wetlands. Open water habitats range from small freshwater ponds to the estuarine waters of the Cooper River. Wetland habitats at JB CHS Weapons can be classified into four major categories (estuarine, palustrine, lacustrine, and riverine) according to the National Wetland Inventory classification system (Cowardin et al., 1979), as described below.

Estuarine. The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have access (either open, partly obstructed, or sporadic) to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from land. Estuaries are extremely productive natural systems that provide spawning, nursery, and feeding habitat for many species of important commercial and sport fishes. Estuarine communities at JB CHS Weapons include salt marsh and brackish marsh communities.

- **Salt Marsh**. Salt marsh communities are present along the lower Cooper River and the lower stretch of Goose Creek. Smooth cordgrass (*Spartina alternaflora*) dominates the tidal marshes of the river and creeks, with lesser components of needle rush (*Juncus roemerianus*), depending on saltiness and elevations.

- **Brackish Marsh**. Brackish marsh communities occupy regularly flooded flats adjacent to the upper stretches of the Cooper River and Goose Creek and their brackish water tributaries. Due to their high productivity, brackish marsh communities function as major exporters of organic matter and provide food, shelter, and nesting sites for a variety of wildlife. This system is dominated by narrow leafed cattail (*Typha augustifolia*), rushes (primarily *J. roemerianus*), bulrushes (*Scirpus spp.*), sawgrass (*Cladium jamaicense*), giant cordgrass (*Spartina cynosuroides*), arrowhead (*Sagittaria spp*.), pickerelweed (*Pontederia cordata*), marshmallow (*Kosteletskya virginica*), and silverling (*Baccharis halimifolia*) are scattered throughout. Wax myrtle is prevalent along the marsh edges.

Palustrine. The palustrine system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand (ppt). It also includes small, shallow, permanent or intermittent ponds. Palustrine wetlands at JB CHS Weapons are dominated by two cover types: forested and emergent. Small areas of scrub/shrub, aquatic bed, and unconsolidated bottom (open water) types are also present.

- **Forested Wetlands**. Forested wetlands cover more than 200 acres (81 ha) at JB CHS Weapons. These wetlands are extremely valuable and help maintain aquatic conditions favorable to fish and wildlife by physically and chemically removing silt and pollutants from upland runoff before it reaches pond and river habitats. They also serve important functions for flood control, groundwater recharge and discharge. The forested wetlands at JB CHS Weapons are typically small isolated

depressions and narrow natural drainage ways leading to ponds or marshes. Water regimes range from temporarily flooded to semi-permanently flooded.

- Bottomland Hardwoods. Bottomland hardwood forest communities represent the dominant cover type found along narrow floodplain reaches, which border tributaries and drainages. Bottomland communities are subject to seasonal inundation and support a diverse mix of mesic hardwood species. Sweetgum, black gum, water oak, live oak, red maple, and swamp chestnut oak (*Q. michauxii*), dominate the canopy, along with an occasional mix of loblolly pine and yellow poplar (*Liriodendron tulipifera*) around floodplain fringes. Understory development typically consists of dogwood, sweet bay, red bay and holly (*Ilex spp*.). Groundcover generally consists of dense thickets of honeysuckle, greenbrier, cane, yellow jessamine and a variety of ferns, including Virginia chain fern (*Woodwardia virginica*), netted chain fern (*W. areolata*), royal fern (*Osmunda regalis var. spectabilis*), and cinnamon fern (*O. cinnamomea*).

- Gum Ponds. Mesic communities known as "gum ponds" occur as circular or regular shaped depressions scattered throughout the Installation. These systems typically range in size from less than one acre (0.4 ha) to nearly two acres, and are characterized by the dominance of sweetgum and black gum. Virginia chain-fern, netted chain-fern, royal fern, and cinnamon fern are usually present in the groundcover. Several gum pond communities contain standing water for a major portion of the year. On sites where substrate saturation or inundation occurs, softrush becomes the dominant groundcover species.

- Cypress Ponds. Forested wetland areas of special significance are a number of bald cypress (*Taxodium distichum var. nutans*) stands. The largest of these is approximately seven acres (2.9 ha) and is the site of one of two active bald eagle nests on the Installation.

- **Emergent & Scrub/Shrub Wetlands**. Emergent wetlands are dominated by perennial, herbaceous vegetation, while scrub/shrub wetlands are dominated by woody vegetation less than 20 feet tall. These wetlands cover approximately 1,500 acres (607 ha) at JB CHS Weapons and are mostly found along freshwater rivers, creeks, and ponds. Vegetation is diverse and includes species such as cattails, bulrush, giant cordgrass, pickerelweed (*Pontederia cordata*), sawgrass, wool grass (*Scirpus cyperinus*), and common three-square (*S. americanus*). The scrub/shrub wetlands are less common and are typically represented by red maple, willow (*Salix spp*.), alder (*Alnus serrulata*), wax myrtle, and buttonbush (*Cephalanthus occidentalis*). These freshwater marshes provide valuable fish and wildlife habitat.

- **Aquatic Bed & Unconsolidated Bottoms**. This class of wetlands includes wetland and open water habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Aquatic beds require surface water for optimum growth and reproduction and are best developed in relatively permanent water or under conditions of repeated flooding. Plants are either attached to the substrate or float freely in the water above the bottom or on the surface (Cowardin et al., 1979). The unconsolidated bottom class includes wetlands with at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent.

  These palustrine wetland classes are represented at JB CHS Weapons by small ponds. These ponds are very shallow, promoting a dense growth of aquatic plants. Typical plant species include alligator weed (*Alternanthera philoxeroides*), floating bladderwort (*Utricularia inflata*), fanwort (*Cabomba caroliniana*), and najas (*Najas spp*.).

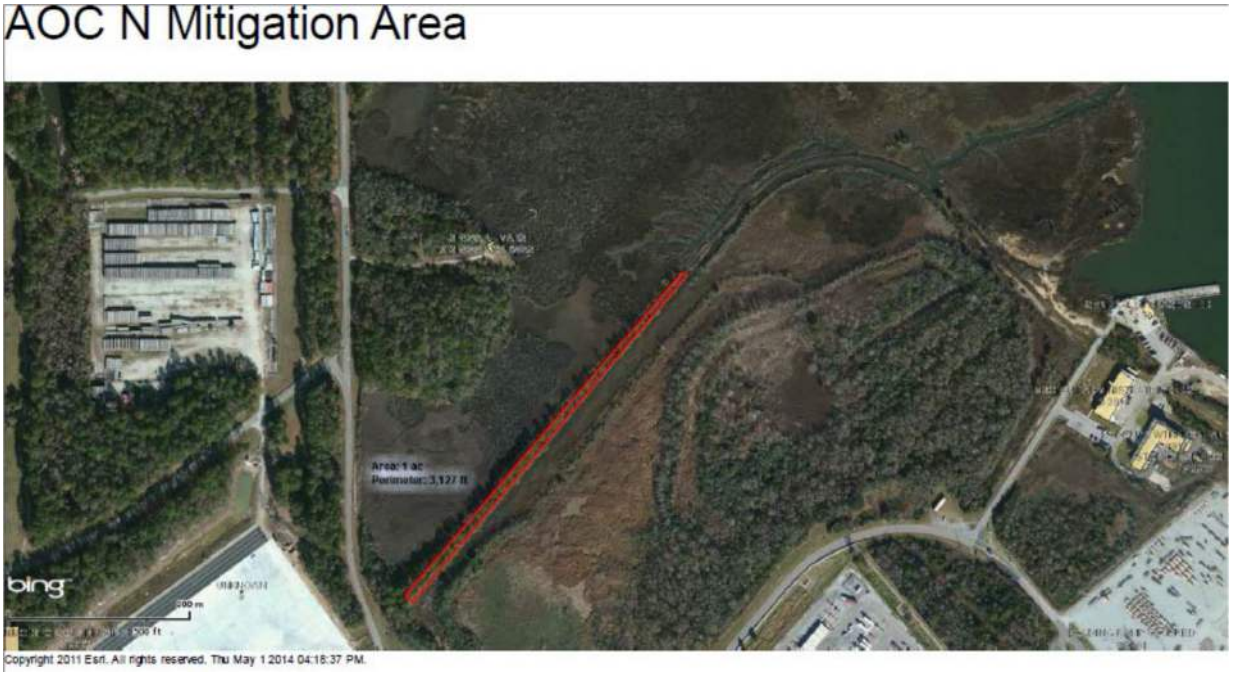
Lacustrine. Lacustrine wetlands are permanently flooded ponds or lakes larger than 20 acres (8 hectares). At JB CHS Weapons this habitat is represented by Big David, Little David, and Hooker

Lake. These impoundments are remnants of the extensive rice culture that dominated this area in the seventeen and eighteen hundreds. Virtually every Installation lowland drainage and marsh finger was once diked and flooded, either for growing rice, or as a reserve pond used to flood the rice fields. Today, 18 impoundments remain with intact dikes holding water. Giant cutgrass (*Zizaniopsis miliacea*), cat tails (*Typha spp*.), white water-lily (*Nymphaea odorata*), water pennywort (*Hydrocotyle spp*.), floating bladderwort (*Utricularia spp*.), alligator weed (*Alternanthera philoxeroides*), and water primrose (*Lugwigia uruguayensis*) characterize these areas.

Riverine. The riverine ecosystem includes all freshwater wetland and deepwater habitats contained within a channel (except wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens). This system is represented by Back River, Foster Creek, Goose Creek, and that section of the Cooper River not influenced by estuarine waters (i.e., approximately the river upstream of Snow Point/Pier X-ray).

Wetlands Mitigation Project – JB CHS Weapons, Solid Waste Management Unit (SWMU) #16

The Environmental Restoration Program (ERP) at JB CHS (Weapons Station) has capped SWMU #16, a cleanup site located between Goose Creek and the area around the intersection of Wilkinson Way and Torpedo Road, Berkeley County, South Carolina. This project required the filling of saltwater marsh wetlands that resulted in a loss of 0.645-acres of tidal marsh. The Army Corps of Engineers (Charleston District) required restoration of 0.65-acres of tidal marsh along the same stream to replace the lost functions of the impacted area. In addition, *in situ* restoration of a 0.014-acres (625 square feet) of contamination was required to enhance the ecological function of the remaining tidal marsh adjacent to SWMU #16. Please see below figures indicating SWMU #16 and the designated mitigation area (i.e., AOC N).



The proposed mitigation, described below, consisted of two parts:

- In situ restoration of the contamination hotspot (625 square feet), and
- Restoration of 0.65-acres of tidal marsh along an abandoned railroad grade.

For further details regarding the in situ restoration, please contact AFCEC/CZOE, Mr. Hayes Patterson, Restoration Program Manager, JB CHS-Weapons Station, at (843) 963-2708, hayes.patterson@us.af.mil.

Site Selection

The mitigation area consisted of ballast (crushed rock) and other fill material historically placed to establish a railroad grade. The upper portion (vertical profile) of this area was ballast that supported the rails. The ballast and other fill material necessary to reach desired elevations was removed. The final elevation of the restoration area was established to match that of the tidal Spartina marsh in the area. Because the hydrology is provided entirely by tidal flow, restoration of this area to tidal marsh is was considered practicable.

Mitigation Work Plan

In Situ Restoration of Contamination Hotspot

This 25 foot by 25 foot area had the upper 12 inches of soil removed. The area was returned to grade with clean soil of a comparable texture and planted with *Spartina alterniflora*.

Restoration of 0.65-acres of Tidal Marsh

Woody vegetation and ballast in the abandoned railroad grade was removed from the mitigation area. The final elevation was returned to that of nearby tidal marsh through removal of other fill material, as necessary, to reach the target elevation. Once the grade was re-established, the area was be planted with *Spartina alterniflora*.

The railroad grade extends from shore as a narrow promontory with an open water area adjacent on one side. The grade was re-established from the distal end, progressing landward to facilitate operation of equipment (from stable railroad grade) as the ballast and other fill material was removed.

Maintenance Plan

The maintenance plan is based on adaptive management as there is no flow regulation devices nor mechanical devices associated with the 0.65-acres of compensatory mitigation area or the 0.014-acres of in situ restoration area. Maintenance will consist of responding to environmental issues that may arise as determined by annual monitoring.

Should the average vegetative cover be less than 30 percent after the second monitoring event, additional planting/sprigging will be done to raise the average cover to a minimum of 50 percent.

Performance Standards

The compensatory mitigation area (0.065-acres) and the 0.014-acre *in situ* restoration area will be determined to be successful if native tidal marsh vegetation provides greater than 70 percent cover. For successful determination, either planted *Spartina alterniflora* or naturally colonizing native species can contribute to the vegetative cover.

While the planting was limited to Spartina alterniflora to provide the greatest potential for rapid vegetation establishment, it is likely that other tidal marsh species will colonize from nearby sources. *Cladium mariscoides* and *Juncus roemerianus* are common in the marsh systems along Goose Creek and either of these species could naturally colonize the mitigation area. The landward portion of the mitigation area could also be colonized by native forb or shrub species that are tolerant of brackish water conditions.

Monitoring Requirements

The mitigation areas will be monitored for vegetative cover and composition each September until the success criterion is demonstrated, for a minimum of five (5) years, as yearly activities once the original contracted work for SWMU #16 is completed. If necessary, monitoring will continue beyond five (5) years until the mitigation project has met its performance standards which are based on at least two (2) consecutive monitoring reports demonstrating mitigation success of greater than 70 percent cover of planted and/or naturally colonizing native species in the restored areas. In addition, monitoring will assess whether there are environmental issues (such as erosion of substrate) that need to be addressed to maintain the mitigation areas.

Monitoring is being done by random sampling, randomized each year. The locations of 10 sample plots is determined randomly prior to the sampling event. The latitude and longitude of 10 points are determined within the boundary of the mitigation area. Sample plots are equivalent to a 10-foot radius circle in area, but, the shape is adjusted to conform to the mitigation boundary if a circle cannot be placed at the pre-determined coordinate and remain within the mitigation area. Use of random plots is minimizing the potential for monitor access to disturb vegetation from repeated trampling and compaction of substrate.

The landward corners of the mitigation area serve as fixed photographic monitoring points as these locations can be accessed without risk of damage to the mitigation areas from repeated trampling.

The project schedule as of Jan 2015 indicates that project completion is expected in Aug 2016, the end of fiscal year (FY) 2016. Therefore, the first successful monitoring event took place in fiscal year (FY) 2017 in September of 2017. At this point the project is on course for completion by 2020.

Long-term management of the mitigation areas will be accomplished through the JB CHS INRMP.

2.3.6 Other Natural Resource Information

Other Natural resources at JBCHS include essential fish habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The term "fish" is defined in the MSA as "fin-fish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds" (16 United States Code [USC] 1802[10]). The regulations for implementing EFH clarify that "waters" include all aquatic areas and their biological, chemical, and physical properties, while "substrate" includes the associated biological communities that make these areas suitable fish habitats (50 CFR 600.10). Habitats used at any time during a species' life cycle (i.e., during at least one of its life stages) must be accounted for when describing and identifying EFH (National Marine Fisheries Service [NMFS] 2002).

JB CHS Air includes a small area of tidal marsh (Figure 2-10). A substantial amount of EHS is present on JB CHS Weapons (Figure 2-12). EFH on or near JB CHS Weapons includes salt marsh, subtidal and intertidal mudflats, unconsolidated bottoms, and tidal creeks. Oyster aggregations, which occur within the salt marsh on JB CHS Weapons, have been designated by the South Atlantic Fishery Management Council as a Habitat Area of Particular Concern for estuarine-dependent species of the snapper-grouper complex.

2.4 Mission and Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

Resources required for the sustainment of the military mission at JB CHS are air space for training and maintaining combat readiness, land area for weapons storage, and civil infrastructure. Climate change will have negligible to no effect on the amount of air and land space available. Additional inland stream channel flooding at JB CHS and NAAF due to climate change is not a major concern due to little to no increase in the floodplain extent of the Ashley and North Fork Edisto Rivers. However, due to the tidal nature of water bodies near JB CHS Weapons, civil infrastructure of this property could be vulnerable to the effects of SLR and SS in the future. Buildings that could be inundated include housing areas, various storage facilities, high explosive magazines, communication system infrastructure, sewage treatment buildings, and administrative buildings. Flooding of the NPTU radiological control facility may jeopardize the containment of contaminated materials. Most roads within one third of a mile of the Cooper River, Back River, Foster Creek, and Goose Creek could be inundated during high water events.

Future impacts to the mission at JB CHS linked to climate change could include:

- increases in temperature and wind velocity leading to unsafe environmental conditions for the launch of current and planned weapons and equipment, resulting in increased maintenance requirements, requirements for new equipment, or decreased launch capacity (DoD, 2014);
- increased dust generation effecting equipment and visibility (DoD, 2014);
- increased wind velocities damaging vital mission infrastructure (Sydeman et al., 2014);
- increased drought potential (Glick, Stein, & Edelson, 2011);

- potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

In addition to these direct effects, climate change has the potential to disrupt the acquisition and transportation of materials required for the maintenance, construction, and storage of the equipment required for these systems (DoD, 2014).

2.4.2 Land Use

The following sections discuss existing land use at each of the JB CHS facilities: JB CHS Air, NAAF, and JB CHS Weapons.

A cooperative JLUS was conducted in 2008 (updating the 1993 JLUS) between Charleston Air Force Base; Charleston Naval Weapons Station; the Berkeley, Charleston, and Dorchester Council of Governments; the Charleston Metro Chamber of Commerce; and others (Office of Economic Adjustment, 2008). The study was designed to encourage cooperative land use planning between JB CHS and the surrounding communities within the Berkeley-Charleston-Dorchester Region; to ensure compatibility of future civilian growth and development with the operational mission objectives of the installations; and to seek ways to reduce the operational impacts on adjacent civilian land. Results and recommendations of the 2008 JLUS are not discussed herein; rather, on-site land use is described for each JB CHS facility, in accordance with AFI 32-7064, Integrated Natural Resource Management. Additional land use information for JB CHS, including proposed land use, is given in the JB CHS General Plan (Zapata, 2010).

Land use categories are described in AFI 32-7064 as improved, semi-improved, and unimproved lands. Improved lands include land occupied by buildings and other permanent structures, as well as lawns and landscape plantings on which personnel annual plan and perform intensive maintenance activities. Improved grounds include the cantonment area, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas. Grass in these areas is normally maintained at a height of two to four inches during the growing season. Semi-improved lands are those where periodic maintenance is performed primarily for operational reasons (such as erosion and dust control, bird control, and visual clear zones). This land use classification includes areas adjacent to runways, taxiways, and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; weapons firing and bombing ranges; picnic areas; ammunition storage areas; antenna facilities; and golf course roughs. Semi-improved grounds areas are mowed less often than the maintained turf grass on improved grounds. Unimproved grounds include forest lands; croplands and grazing lands; lakes, ponds, and wetlands; and any areas where natural vegetation is allowed to grow unimpeded by maintenance activities.

2.4.2.1 Air Base

The following is a discussion of land use at JB CHS Air in accordance with the previously defined general land use categories. Improved and semi-improved lands make up approximately 38 and 40 percent of the land area, respectively. Unimproved lands account for approximately 22 percent of total land area at JB CHS Air (Table 2-17; Figure 2-13).

Table 2-17. Land use summary for Joint Base Charleston

	Land Use Categories		
	Improved	Semi-Improved	Unimproved
	---acres (*percent*)---		

JB CHS Air	1,294 *(38 percent)*	1,327 *(40 percent)*	734 *(22 percent)*
NAAF	203 *(9 percent)*	846 *(38 percent)*	1,193 *(53 percent)*
JB CHS Weapons	2,067 *(11 percent)*	2,057 *(11 percent)*	14,613 *(78 percent)*

Improved Lands

Improved lands are the dominant land use at JB CHS Air and include areas used for industrial, administrative, family housing, and community purposes. The majority of the improved land area at the Base is the airfield, which includes runways 15/33 and 03/21, the taxiway network, and the main parking ramp. Aircraft Operations and Maintenance is interdependent with the airfield land use, and is arrayed in the area west of the main parking apron and along Bates Street. This area includes aircraft maintenance hangers, component repair shops, squadron operations buildings, base operations, passenger terminal, air freight terminal and other supporting facilities.

Industrial land uses are consolidated in the north central area of the Base in a corridor defined by Arthur Drive on the west and Graves Avenue on the east. The Base petroleum/oil/lubricant storage area and the Base civil engineer complex are located on the north end of the corridor on Stewart Avenue. Other industrial operations within the area include Base supply warehouse and operations area south of Stewart Avenue and the central heating plant north of Sloan Street. Other, less expansive industrial areas include the Base ammunition storage area southwest of the main gate on Arthur Drive. Facilities of concern with regards to potential contaminants include the hangars, aircraft parking, and the bulk fuel storage area.

Administrative land uses at JB CHS Air are concentrated in the area surrounding the intersection of Hill Boulevard and Graves Avenue. Major activities in this area include the 437th AW headquarters, located on the south side of Hill Boulevard, and the Base personnel office. Also within this area are the Printing and the Communications Squadron at the southwest corner of Graves Avenue and Hill Boulevard and the Security Police Squadron on Graves Avenue.

Family housing land uses are found principally in the western portion of the Base on either side of Hill Boulevard, as well as Hunley Park family housing, which is located west of Dorchester Road adjacent to the main gate. Unaccompanied housing for enlisted personnel is consolidated in the 400 area, which is bounded by Scott Street, Simpson Street, Arthur Drive and Davis Drive.

Community land uses at JB CHS Air are located to serve both accompanied and unaccompanied personnel. Adjacent to North O'Neal Avenue in the family housing area is a large consolidated area that includes the Base Exchange, commissary, gas station, youth center and child development center. Other Base-wide community functions, including the library, bowling center, chapel and Palmetto Community Activities Center, are centrally located on or just off of Hill Boulevard. Wrenwoods golf course, located west of Arthur Drive and north of the family housing neighborhood includes 18 holes, putting and chipping greens, a driving range and clubhouse with pro shop. The clubhouse is located on Hill Boulevard at the intersection with Davis Drive. The consolidated medical and dental clinic is located at the southeast corner of Arthur Drive and Hill Boulevard.

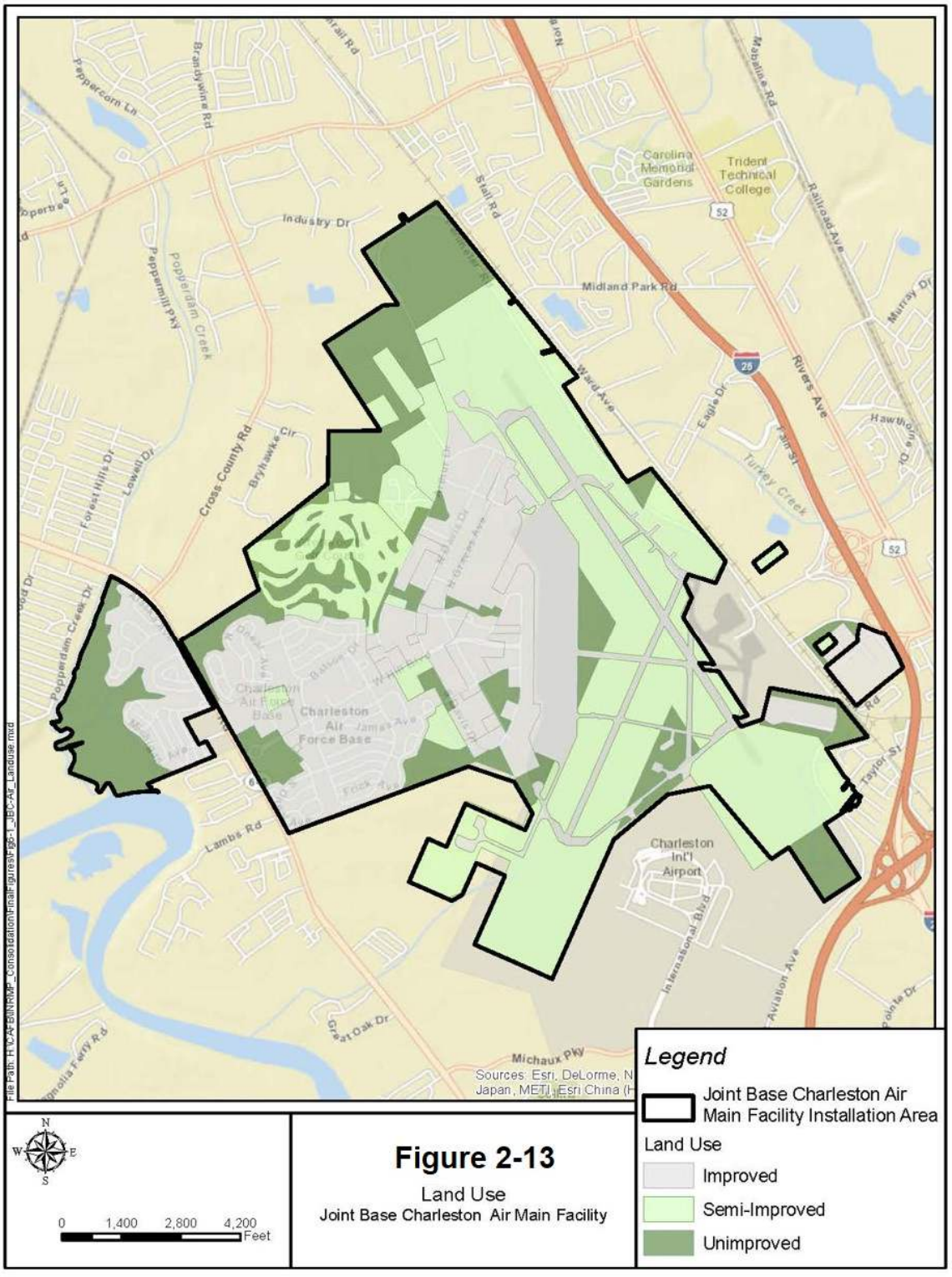


Figure 2-13. Land use – JB CHS Air Base

Semi-improved Lands

Areas adjacent to runways, taxiways, and aprons, runway clear zones, and lateral safety zones make up the majority of land use within this category at JB CHS Air (Figure 2-13). JB CHS Air also has a variety of outdoor recreation and other areas located throughout the Base that are encompassed within semi-improved land areas. Other semi-improved areas include the skeet and trap range east of the main gate house on Arthur Drive, two soccer fields west of Arthur Drive and the family camp and picnic grounds located north of the trailer park and west of Arthur Drive. Outdoor recreation areas for team sports include the softball complex located northwest of the picnic grounds and the two softball fields, running track, tennis courts and multi-purpose field behind the sports and fitness center on Hill Boulevard. There are no hunting, fishing or horseback riding areas on JB CHS Air.

Unimproved Lands

Open space on JB CHS Air is mostly airfield borders, small timber stands, and drainage ways, including the forest and scrub/shrub wetlands adjacent to Popperdam Creek and west of Hunley Park (Figure 2-13).

2.4.2.2 North Auxiliary Airfield

The following is a discussion of land use at NAAF in accordance with the previously defined general land use categories. Improved and semi-improved lands make up approximately 9 and 38 percent of the land area, respectively. Unimproved lands account for approximately 53 percent of total land area at NAAF (Table 2-17, Figure 2-14).

Improved Lands

Developed portions of NAAF consist of a 12,000-foot primary runway, a 5,000-foot secondary runway, a 3,000-foot assault landing strip for C-17 aircraft, and a 5,000-foot parking ramp. It also includes support infrastructure including a fire station, an aerial delivery facility, a fueling station, a water storage system, and a network of paved and unpaved roads.

Semi-improved Lands

Land use within this category includes areas adjacent to runways, taxiways, and aprons, runway clear zones, and lateral safety zones (Figure 2-14).

Unimproved Lands

The undeveloped acreage at NAAF is used for hunting and fishing (Section 7.2). The predominant natural community at NAAF is the 426-acre bottomland hardwood swamp associated with the floodplain of the North Fork Edisto River located in the southern portion of the installation. Forested areas are managed for wildlife (Section 7.1) and rare species (Section 7.4) protection, as well as forestry (Section 7.8) and wildland fire (Section 7.9) activities.

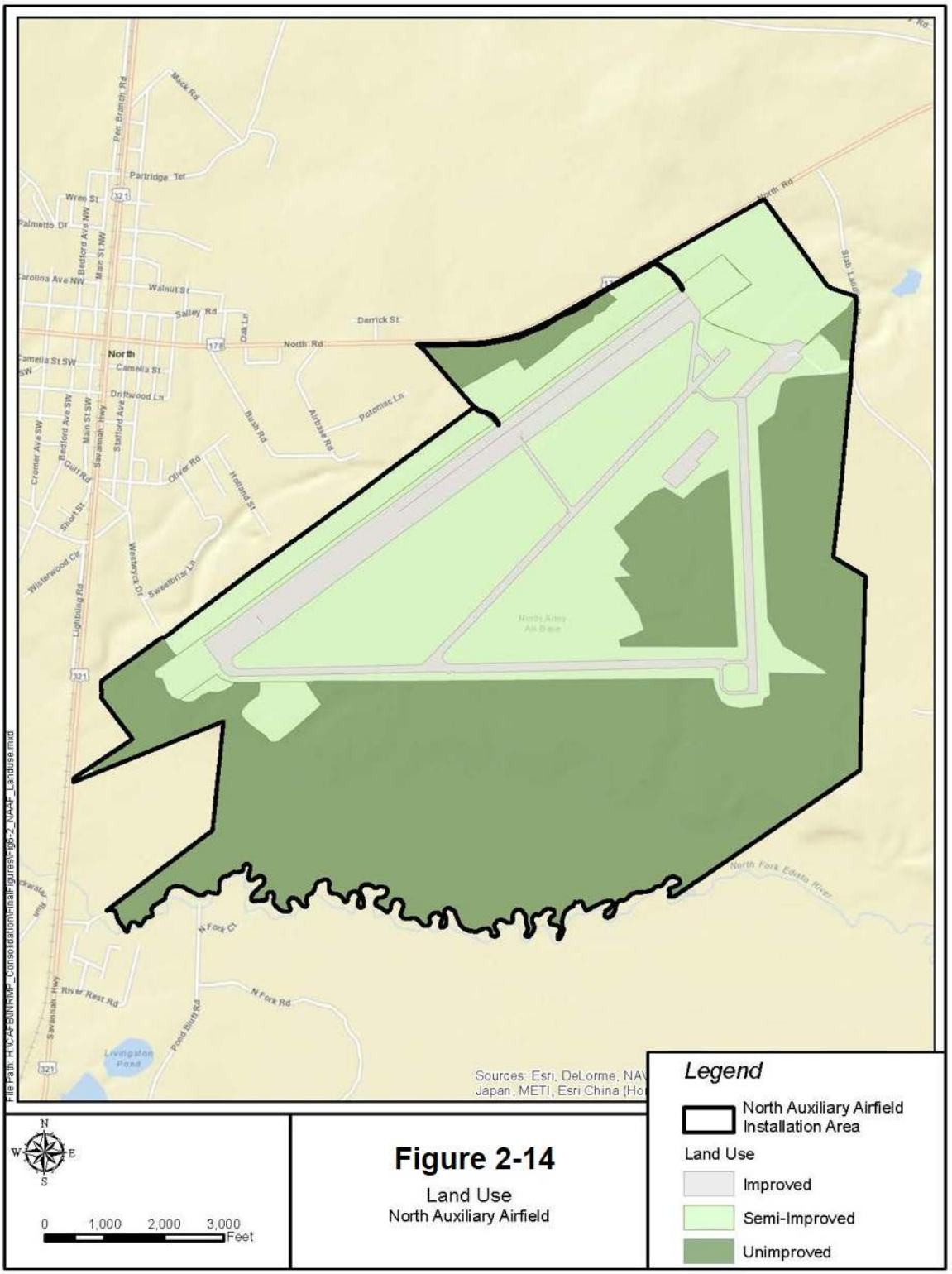


Figure 2-14. Land use – Joint Charleston North Auxiliary Airfield

2.4.2.3 Weapons Station

A Land Use and Development Plan for JB CHS Weapons exists to provide a framework for installation development (Atriax Group, 2011). Existing land use conditions and environmental and man-made constraints to development are identified, described, analyzed, and mapped. Areas of preferred, high, limited, and restricted development potential are identified, along with incompatible land uses and recommendations for potential resolution of incompatibilities. Results and recommendations of the 2008 JLUS are not discussed herein; rather, on-site land use is described for each JB CHS facility in the following sections in accordance with AFI 32-7064, Integrated Natural Resource Management.

The following discussion of land use at JB CHS Weapons is consistent with previously defined general land use categories. Improved and semi-improved lands make up approximately 11 and 11 percent of the land area, respectively. Unimproved lands account for approximately 78 percent of total land area at JB CHS Weapons (Table 2-17, Figure 2-15).

Improved Lands

Improved lands comprise 2,067 acres or 11 percent of the land base at JB CHS. Training areas account for the most prevalent land use within improved land areas at JB CSH Weapons. There are three large training areas: FLETC in the Northside area (746 acres), NNPTC (119 acres) and NPTU (32 acres) in the Southside area.

Other improved lands include those used those used for operations, housing, and personnel support, and other uses. Operational land use (422 acres) occurs in the Army Strategic Logistics Activity Charleston (ASLAC) complex and Explosive Ordnance Disposal (EOD) area in the Northside, in the Southside - Waterfront Operations Area in the vicinity of Wharf Alpha, Pier Bravo, Pier Charlie (142 acres), and in the South Annex in the vicinity of the TC Dock (65 acres). Family Housing occurs in the MENRIV Housing Area (429 acres) and Southside Housing Area (70 acres). Personnel support areas include JB CHS Weapons personnel support functions in the Southside - Main Station (99 acres), outleased school areas (53 acres in aggregate), dispersed parcels in the Southside - Industrial Area (22 acres in aggregate), and the NAVCONBRIG in the South Annex (22 acres).

Other improved land use areas at JB CHS Weapons include the fairways, greens and tees of the Redbank Plantation Golf Course (14 acres), warehouse storage areas (119 acres), and administrative/research areas (102 acres) in the South Annex. Industrial land uses, the least prevalent, occur in association with tenant activities on the Southside-Industrial Area (29 acres) and on the Northside (7 acres). Also included are softball/baseball fields, soccer fields, playgrounds, two swimming pools, and a roller hockey rink.

Semi-improved Lands

Semi-improved lands comprise 2,057 acres or 11 percent of the land base at JB CHS. Dredge spoil disposal areas, ordnance storage areas and utility line ROWs comprise the majority of area within the semi-improved lands classification at JB CHS Weapons. Other semi-improved areas include road shoulders, wildlife openings, an explosive ordnance range; field testing areas; and recreational areas including picnic grounds; multipurpose trails (hiking, biking, and horse riding); and golf course roughs.

Unimproved Lands

Over three-quarters (78 percent) of the land controlled by JB CHS Weapons (14,613 acres) is currently undeveloped or unimproved. This figure includes many hundreds of acres of wetlands along Foster and

Goose Creek as well as salt marsh along the Cooper River. The majority of the remaining unimproved areas are part of the managed timberlands of JB CHS Weapons.

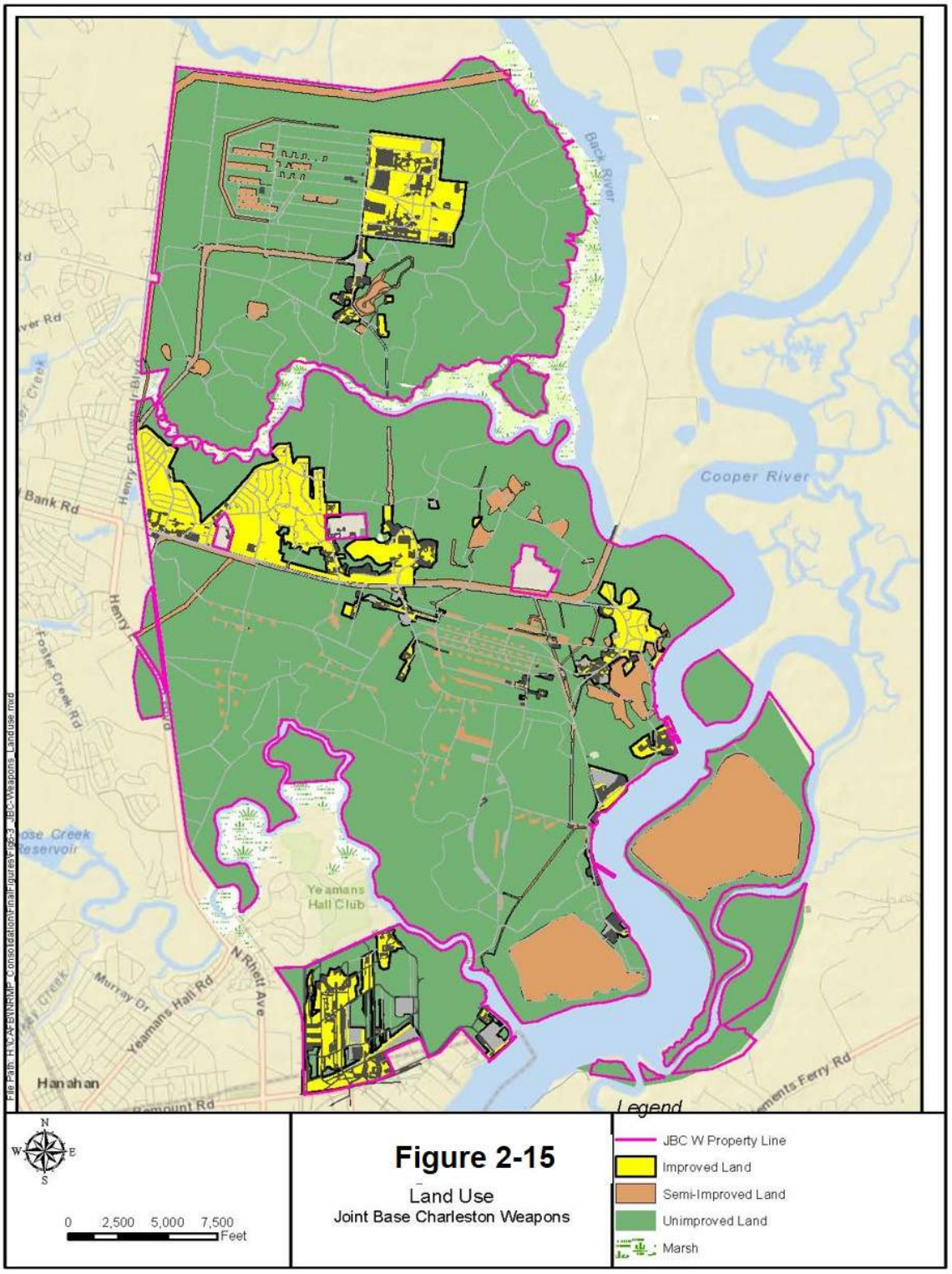


Figure 2-15. Land use – Joint Base Charleston Weapons

2.4.3 Current Major Mission Impacts on Natural Resources

The following sections describe current mission operations that affect or may potentially affect natural resources at JB CHS. Included are potential sources of air and water pollution, vegetation management required to support airfield operations or ranges, and ground water contamination sites and environmental restoration activities.

2.4.3.1 Air Base

Sources of Air Pollution

JB Charleston Air Base is located within U.S. EPA Air Quality Control Region IV, which generally has good air quality. The Base is located in an area which is in compliance with National Ambient Air Quality Standards. The Base has a permit SCDHEC (Number 560-0019) for operating the solid waste incinerator. Bulk fuel storage, operations generating volatile organic compounds, paint spray booths, and bead blast units are reviewed on a case-by-case basis for permit requirements by SCDHEC and have been considered exempt. The emergency generators used throughout the Base are exempt from permit requirements because they are operated 250 hours or less per year in addition to emergency operations.

Sources of Water Pollution

Wastewater. All sanitary and most industrial wastewater from JB CHS Air is discharged to the North Charleston Sewer District for treatment. The discharge is monitored monthly for pH, oil and grease, and periodically for other constituents. Solid waste disposal for JB CHS Air is detailed in the JBC General Plan.

Storm water. JB CHS Air has implemented a SWPPP (Advent, 2011) to minimize the risk of storm water pollution in drainage areas located within Base boundaries. This plan complies with the SCDHEC General Permit SCR000000 (November 12, 2010) requirements for authorization to discharge storm water associated with industrial activity under the National Pollutant Discharge Elimination System (NPDES) Program. Objectives of the JB CHS Air SWPPP are to identify and evaluate sources of storm water pollution and to describe and implement pollution reduction measures and controls or BMPs.

Thirteen drainage areas and associated outfalls were established for JB CHS Air in the 2011 SWPPP. These outfalls consist of a system of open drainage swales and underground storm sewers that discharge to culverts and pipes. During rain events, inlets in paved areas and roadways collect storm water runoff from industrial and developed portions of the Base. Runoff from the unpaved areas is generally routed into open drainage channels. Irrigation waters, hydrant flushings, potable water piping repair flushings, and various other non-storm water runoffs are discharged to the storm water system, but account for only a small fraction of the total flow. No super-chlorination is conducted on water that is flushed from repaired piping or fire hydrants. All flushed water is within drinking water standards for chlorine levels.

Industrial activities occur in three of the 13 drainage areas, for which monitoring is required. Outfalls that discharge from areas separate from JB CHS Air's industrial activities are excluded from such requirements. Quarterly visual assessments of storm water discharges are performed, documented, and kept on file. Storm water samples are collected from three outfalls, as required by the permit. Samples are analyzed for fecal coliform and total suspended solids and are visually inspected for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oily sheen, and other signs of pollution.

TMDLs. JB CHS Air discharges to two impaired waters, the Ashley River and Goose Creek, and is therefore required to monitor for all pollutants for which the water body is impaired and for which a standard analytical method exists. The Ashley River is an impaired water with an EPA approved TMDL for dissolved

oxygen (DO; http://www.scdhec.gov/environment/water/tmdl/docs/tmdlashl03.pdf). Goose Creek is an impaired water without an EPA approved TMDL.

Available information indicates the upper Ashley River does not meet the applicable water quality standard for DO for significant periods of time due to natural conditions exacerbated by point and nonpoint sources of pollution; therefore, Section 48-1-83 (Pollution Control Act) and Section D.4.a. of R.61-68 (Water Classifications and Standards) apply. These provisions allow a lowering of DO of no more than 0.10 mg/L (the Tenth Rule). Therefore, the TMDL for Ashley River was developed to ensure point source compliance with the Tenth Rule provision of R.61-68. Nonpoint sources of pollution were not addressed and the loadings identified in the TMDL will be implemented through limits placed on NPDES permits (wastewater treatment facilities). Additional information regarding TMDLs in relation to JB CHS Air is given in Section 2.2.4.1.

Other Potential Sources. Potential sources of water pollution at JB CHS Air are identified as materials that may be exposed to precipitation or storm water runoff. On-site materials include gasoline, diesel fuel, kerosene, jet fuel and oils. These materials are mainly stored in aboveground storage tanks (ASTs), underground storage tanks (USTs), mobile bowsers, or fuel trucks. The SWPPP for JB CHS Air lists the major facilities of concern situated within each drainage area, their exposed materials, storage methods, and quantities stored.

Activities and practices at JB CHS Air that have the potential to release pollutants into storm water runoff include loading and unloading operations, outdoor storage, waste disposal practices, and aircraft and vehicle washing and fueling. Potential pollutant sources include fuel, oil and grease, and washwater. Potential pollutants of concern associated with these source materials are listed in Table 2-18. A summary of related activities and practices follows.

Table 2-18. Industrial activity summary at JB CHS Air and storm water polluntant sources

Potential Pollutant Sources	Potential Pollutants of Concern
Kerosene, gasoline, diesel fuel (LS-2), JP-8, pesticides, herbicides, propylene glycol, Aqueous Film-Forming Foam (AFFF), hydraulic oil, synthetic oil, transmission oil, and used oil	BOD_5, COD, benzene, naphthalene, oil, and grease
Runoff from impervious surfaces, erosion, and sediment loading	TSS
Residue from aircraft and vehicle maintenance operations, pesticides, and wash racks.	Metals (lead, copper, cadmium, chromium, and zinc)
Runoff from Firing Ranges	An M-16 firing range is located on Base and is covered and not exposed to storm water. Other outdoor firing ranges on Base are closed and inactive.

Loading and unloading operations: The primary concern for potential storm water contamination is from fuel handling on the airfield runways and aprons. Fuels such as jet fuel (JP-8) are transferred, loaded, unloaded, and stored on Base and are exposed to rain events. A pollutant of concern, naphthalene, is a component of JP-8.

Outdoor storage: Outdoor storage of significant materials is limited to ASTs with secondary containment; hazardous materials and hazardous waste are stored mainly in contained and covered sheds or hazardous materials (HAZMAT) lockers.

The total aircraft, vehicle, and heating fuel tank storage capacity is 4,377,650 gallons at JB CHS Air. The fuels are stored primarily in ASTs (3,687,650 gallons). The remaining 690,000 gallons is stored in USTs. The fuel tank farm has the largest amount of storage with 3,265,000 gallons of AST storage capacity. The largest tank at the Base is the 2.3 million gallon AST JP 4 (8) tank in the fuel farm.

Onsite waste disposal practices: Hazardous waste is collected and stored in HAZMAT lockers at various points at JB CHS Air. This waste is shipped to the hazardous waste storage yard (Building 691).

Aircraft and vehicle washing: All aircraft washing activities are performed indoors. Wash water discharges to oil water separators (OWSs). Vehicles on Base are washed at wash racks across the Base, which discharge to OWSs. All OWSs that receive wash water from aircraft or vehicle washing discharge to the sanitary sewer system. SCDHEC NPDES Permit #SCG750000, General Permit for Vehicle Wash Water Discharges provides coverage for washing fire department vehicles and the AAFES community car wash.

The SWPPP describes management practices that are used to minimize pollution in storm water at JB CHS Air. Management guidelines have been developed specifically for the following:

- Hazardous materials management;
- Hazardous waste management;
- Pesticide management;
- Petroleum, oil, and lubricants management; and
- Shop operations.

A plan for spill prevention and control, and management practices for personnel training, facility inspections, and preventive maintenance is also given in the SWPPP.

Vegetation Management Required to Support Airfield Operations/Ranges

The direct elimination of threats to air navigation at JB CHS Air is an Air Force and Federal Aviation Administration requirement. JB CHS Air attains applicable airfield operations criteria by removing intruding trees on 394 acres of forest land near the ends of the runways, specifically the clear zone graded areas, approach-departure surfaces, and transitional surfaces (as defined in UFC 3-260-01) for Runways 03, 33, and 15. Wetland forests and painted bunting habitat are impacted by these practices.

A moderate wildlife-aircraft strike hazard exists at JB CHS Air and the surrounding areas due to resident and migratory wildlife. Daily and seasonal bird movements, as well movement from non-flying wildlife, create a hazard to aircraft operations. Vegetation management required to minimize the wildlife-aircraft strike hazard at JB CHS Air includes the following:

- Mowing the airfield to maintain a uniform grass height between seven and 14 inches within established airfield mowing zone boundaries;
- Eliminating all growth in airfield ditches and performing weekly checks to monitor contractor performance;

- Identifying and draining standing water in low areas to reduce bird/wildlife habitat. Designated wetland areas are exceptions and will not be drained; and

- Maintaining homogeneous vegetation areas on the airfield through elimination of stands of brush and shrubs from grassy areas and performing monthly checks to verify conditions.

Groundwater Contamination Sites and Environmental Restoration Activities

The Air Force Installation Restoration Program (IRP) establishes a process to evaluate past disposal sites, control the migration of contaminants, control potential hazards to human health and the environment, and conduct environmental restoration activities as required. The Navy IRP follows the same procedures, but is centrally managed through the Naval Facilities Command structure.

JB CHS Air has a Resource Conservation and Recovery Act (RCRA) Part B permit that identifies 111 sites (95 solid waste management units[SWMUs] and 16 areas of concern) as potentially impacted by past hazardous material or hazardous waste activities which require investigation and remediation. Currently, 33 of these sites are managed under the Base's IRP. The 33 IRP sites include inactive landfills, inactive fire protection training areas, hazardous chemical and fuel spill sites, fuel disposal sites, hazardous storage areas, leaking underground storage/transfer systems, waste treatment facilities, munitions disposal sites, and others which include hard fill and entomology areas. Development in these areas should be avoided until the site remediation activities are completed and restrictions for development are removed.

2.4.3.2 North Auxiliary Airfield

Sources of Air Pollution

Because of the small number of staff present at NAAF, there are no significant air pollution sources.

Sources of Water Pollution

Wastewater. Six septic tanks are used for wastewater treatment at NAAF.

Storm water. NAAF has implemented a SWPPP (Advent, 2011) to minimize the risk of storm water pollution in drainage areas located within Base boundaries. This plan complies with the SCDHEC General Permit SCR000000 (November 12, 2010) requirements for authorization to discharge storm water associated with industrial activity under the NPDES Program. Objectives of the NAAF SWPPP are to identify and evaluate sources of storm water pollution and to describe and implement pollution reduction measures and controls or BMPs.

Sixteen drainage areas and associated outfalls were established for NAAF in the 2011 SWPPP. These outfalls consist of a system of open drainage swales. During rain events, drainage ditches collect storm water runoff from the airfield. Runoff from the unpaved areas is generally directed or routed into open drainage channels.

Industrial activities occur in three of the 16 drainage areas, for which monitoring is required. Outfalls that discharge from areas separate from NAFF's industrial activities are excluded from such requirements. Quarterly visual assessments of storm water discharges are performed, documented, and kept on file. Storm water samples are collected from three outfalls, as required by the permit. Samples are analyzed for fecal coliform and total suspended solids and are visually inspected for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oily sheen, and other signs of pollution.

TMDLs. There are four water quality monitoring stations in the vicinity of NAAF that are on the 303(d) list of impaired waterbodies (Figure 2-6, Table 2-8). Causes of impairment for 303(d) listed stations surrounding NAAF include fecal coliform and mercury. TMDLs have not yet been approved for these station locations.

Vegetation Management Required to Support Airfield Operations/Ranges

The direct elimination of threats to air navigation at NAAF is an AF and Federal Aviation Administration requirement. NAAF attains applicable airfield operations criteria by removing intruding trees, either by clear-cut or selective cutting, on 275 acres of forest land near the ends of the runways, specifically the clear zone graded areas, approach-departure surfaces, and transitional surfaces (as defined in UFC 3-260-01). Forests and painted bunting habitat are impacted by these practices.

A moderate wildlife-aircraft strike hazard exists at NAAF and the surrounding areas due to resident and migratory wildlife. Daily and seasonal bird movements, as well movement from non-flying wildlife, create a hazard to aircraft operations. Vegetation management required to minimize the wildlife-aircraft strike hazard at NAAF includes the following:

- Mowing the airfield to maintain a uniform grass height between seven and 14 inches within established airfield mowing zone boundaries;
- Eliminating all growth in airfield ditches and performing weekly checks to monitor contractor performance;
- Identifying and draining standing water in low areas to reduce bird/wildlife habitat. Designated wetland areas are exceptions and will not be drained; and
- Maintaining homogeneous vegetation areas on the airfield through elimination of stands of brush and shrubs from grassy areas and performing monthly checks to verify conditions.

Groundwater Contamination Sites and Environmental Restoration Activities

No groundwater contaimination sites have been identified at NAAF.

2.4.3.3 Weapons Station

Sources of Air Pollution

JB CHS Weapons has a conditional Major Air Quality Permit from SCDHEC. A report is prepared annually summarizing the emissions from over 400 sources. JB CHS Weapons has consistently documented that its emissions are less than the threshold to be classified as a major source of pollutants regulated by the Clean Air Act. Approximately 75 percent of the emissions sources are combustion sources used for comfort heat and clothes drying. The remaining 25 percent of emission sources support mission requirements and consist predominantly of generators, parts cleaners, and paint booths.

In addition to permitted air emission sources, JB CHS Weapons has an active prescribed fire program. The goal of the program is burn an average of 3,000 to 4,000 acres per year on a rotation of 3 years. Prescribed burning produces smoke, which consists of small particles (particulate) of ash, partly consumed fuel, and liquid droplets. Particulates are of special concern because they reduce visibility. The other combustion products include invisible gases such as carbon monoxide, carbon dioxide, hydrocarbons, and small quantities of nitrogen oxides. In general, prescribed fires produce

inconsequential amounts of these gases. To minimize smoke impacts and protect public health, forest managers at JB CHS Weapons and air regulators work together to match burning times and locations with appropriate atmospheric conditions. The Wildland Fire Management Plan (Section 15, Tab 1) is designed to support the mission at JB CHS and focus on the protection of mission resources through reduction and prevention of wildfires and the restoration and maintenance of native ecosystems and habitats. The plan outlines policies, procedures and protocols used in minimizing and combating wildfires and the planning, conduct, and use of prescribed fires at JB CHS facilities and discusses potential interactions between the military mission and the wildland fire program.

Sources of Water Pollution

Water pollution at JB CHS Weapons is of particular concern because of the large amount of EFH on and around the installation (see Section 2.3.6). The sections below describe the procedures that are in place to monitor and minimize potential water pollution sources and limit potential impacts to EFH.

Wastewater. The treatment and disposal of sanitary sewage at JB CHS Weapons is by Berkeley County Water and Sewer Authority (BCW&SA) and the North Charleston Sewer District (NCSD). There are four discharge points serving JB CHS Weapons. The first, known as Navy-1, is a 12-inch force main that serves the Northside Area. The second is a 10-inch line, Navy-2 (Lift Station 66), which discharges to BCW&SA headworks on Redbank Road, and serves Officer Housing. Navy-1 and Navy-2 are both permitted by BCW&SA and sampled as industrial pre-treatment discharge points. The third discharge point is domestic waste from the NIWC and is an eight-inch line that discharges to a treatment plant, owned and operated by BCW&SA. The fourth and final discharge point is a domestic line that covers the remainder of the South Annex, and discharges to a NCSD lift station at the intersection of Remount Road and Virginia Ave.

Storm water. JB CHS Weapons has three NPDES permits (one industrial, two storm water) that cover the Base. The Industrial NPDES permit covers three outfalls at NPTU that are monitored for temperature and chlorine. The industrial storm water permit captures the industrial areas of JB CHS Weapons. Visual monitoring is conducted at 18 outfall locations for color, odor, clarity, floating solids, settled solids, suspended solids, foam, and oil sheen. The third permit is the Base municipal separate storm sewer system (MS4) permit (and associated Storm water Management Plan [SWMP] and SWPPP) which covers all 17,000 acres and addresses water quality across the entire storm sewer collection system. Public Education and construction BMPs are key component of the permit to reduce and control pollutants to the storm water conveyance system.

The SWMP delineates JB CHS Weapons into 65 drainage basins with corresponding outfalls that drain to the Cooper River, Foster Creek or Goose Creek. Twenty-five of these outfalls discharge storm water from developed areas of the Station and 40 outfalls discharge storm water from forested, unoccupied areas of the Station. Only 15 outfalls are considered discernable point sources; the remaining 50 outfalls are open channel swales.

TMDLs. SCDHEC has identified impaired waters in the vicinity of JB CHS Weapons (Figure 2-6, Table 2-8). Causes of impairment for TMDL, or 303(d) listed stations surrounding the station include (low) dissolved oxygen, Total Phosphorus and chlorophyll a (Goose Creek Reservoir), fecal coliform, and mercury (for fish consumption). Monitoring sites have been established for mercury and dissolved oxygen. Additional information regarding TMDLs and TMDL monitoring at the Station is given in the SWPPP for JB CHS Weapons.

Other Potential Sources. As part of the SWMP, JB CHS Weapons has identified a list of potential pollutant sources based on installation knowledge and staff interviews. These sources have been prioritized to provide a basis for inspection and utilization of the proposed BMPs (Table 2-19).

Vegetation Management Required to Support Airfield Operations/Ranges

There are no airfield operations at JB CHS Weapons. An explosive ordnance disposal area is located in the Northside Area of the Station. A 12 acre clear zone is maintained by mowing and occasional disking.

Groundwater Contamination Sites and Environmental Restoration Activities

JB CHS Weapons holds a RCRA Part B and Subpart X permit that identifies a total of 104 sites (89 SWMUs and 15 areas of concern). Of these, a determination of No Further Action required has been made for 53 of the SWMUs. The 36 remaining SWMUs are at various stages of evaluation or cleanup. The majority of these sites can be classified as inactive landfills, hazardous chemical and fuel spill sites, hazardous waste storage areas, unexploded ordnance burial sites, munitions disposal sites, and pesticide/herbicide handling areas. The Subpart X portion of the permit obtained in September 2003 allows JB CHS Weapons to operate the EOD range for the treatment and disposal of explosive hazardous waste generated on site. The range also functions in a dual use capacity for training of EOD personnel and site for emergency response operations. The range is designated as a class C range (150 pound Net Explosive Weight) under Naval Sea Systems Command (NAVSEA) OP-5.

Table 2-19. Potential pollutant sources at Joint Base Charleston Weapons

Activity/Source	Pollutant of Concern	Location	Priority
Building Maintenance	Wash water, cleaning products, dirt, sediment, paint chips	Non-Specific	Medium
Chemical Spills	Various industrial chemicals, cleaning products, fluids	Non-Specific	Medium
Construction Activities	Concrete, sediment, paint	Non-Specific	High
Erosion	Sediment, organics	Non-Specific	Medium
Grounds Maintenance	Pesticides, herbicides, fuel, oil	Staging & equipment storage areas	High
Sewage Line Breaks	Raw sewage	Non-Specific close attention to areas on Base with old sewer lines	High
Litter	Litter	Non-Specific	Low
Irrigation	Pesticides, herbicides, fuel, oil	Non-Specific	Low
Contractor Lay-down Areas	Asphalt, gravel, sand, binder chemicals, fuel, oil	Emphasis on contractor lay down areas. 11th Street	High
Painting	Paint, oil, paint thinner	Non-Specific	Low
Parking Lots	Fuel, oil, various vehicle fluids	Non-Specific. Largest areas include commissary, NEX, and nuclear school and equipment overflow at pier C, Wharf A, TC Dock, and AFSBn CHS	High
Trash Storage Area	Organics, hazardous materials	Non-Specific. Close attention given to Housing, schools and food services	Medium
Vehicle and Equipment Washing	Cleaning products, fuel, oil, sediment	MENRIV carwash, washrack	High
Vehicle Maintenance	Fuel, oil, vehicle fluids	Building 41, Army Reserve Center, MWR, motor pool,Goose Creek Boat House, TC Dock	High
Pool Facilities	Pool chemicals	MWR Pools	Medium
Fuel Points	Fuel, oil[1]	NEX Gas Station, FISC Gas Station, DFSP Pipeline	High
Pets	Organics, fecal	Housing, MWR area	Low

[1] JB CHS Weapons has a fuel and oil storage capacity of 240,320 gallons. Fuel is used primarily for automotive fuel, emergency power generation, and heating. Major components of the oil storage include waste/used cooking oil, hydraulic oil, and motor oil. A majority of this fuel and oil (143,820 gallons or 60 percent) is stored in 45 Underground Storage Tanks (USTs). The remaining 96,500 gallons is stored in Aboveground Storage Tanks (ASTs). Navy policy dictates that vessels refuel at sea. In the event that this is not possible, NPTU nuclear vessels are re-fueled at Norfolk Naval Shipyard. The main automotive refueling points on Base are at buildings 724, 922, 304, 199, and the boathouse at the South Annex.

2.4.4 Potential Future Mission Impacts on Natural Resources

At this time potential future mission impacts on natural resources at JB CHS appear fairly limited. A major construction project in the Northside area to construct MRAP storage facilities for the AFSBn – CHS is in the final planning stages. This would require clearing several hundred acres of forestland with all the associated impacts. Otherwise, no major projects or changes in mission that would impact natural resources are currently projected. A Land Use and Development Plan for JB CHS exists to provide a framework for installation development (Atriax Group, 2011).

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and its Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*; DoDI 4715.17, *Environmental Management Systems*; AFI 32-7001, *Environmental Management*; and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems – Requirements with guidance for use*, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively manage associated risks, and instill a culture of continual improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management-related roles and responsibilities are described in appropriate sections of this plan.

Office/Organization/Job Title Listing is not in order of hierarchical responsibility	**Installation Role/Responsibility Description**
Installation Commander	The Installation Commander approves the INRMP and any necessary revisions, provides appropriate funding and staffing to ensure effective implementation of the INRMP, and controls access to and use of installation natural resources. Once the INRMP is signed by the Installation Commander, Regional Director of the USFWS, and Director of the SCDNR, JB CHS is committing responsibility to the objectives and methodologies of the plan. Commanders of tenant commands are required to be familiar with the INRMP and comply with its provisions.
AFCEC Natural Resources Media Manager/SME/Subject Matter Specialist (SMS)	AFCEC provides and manages cooperative agreements to assist installations (AFI 32-7064 1.2.2.3.).

Tenant Commanders and Commanders of JB CHS assigned/associate units	Tenant Commanders and Commanders of assigned and associate units are required to be familiar with the content of the INRMP and ensure their units comply with its provisions.
JB CHS Security Forces Squadron	Security forces assist in enforcement of Natural Resource program policies and procedures described in the INRMP.
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	UECs work with the Natural Resource program to resolve any natural resource issues that affect their Unit.
The base Natural Resources Manager is also the base Wildland Fire Program Manager (WFPM)	The WFPM works with the Natural resource program to plan and implement the base's wildland fire program focusing on fire's effects on natural resources.
Pest Manager (PM)	The PM works with Natural resource program to plan and implement IPMP focusing on effects on natural resources.
Conservation Law Enforcement Officer (CLEO)	JB CHS lacks a Conservation Law Enforcement Officer.
National Environmental Policy Act (NEPA)/Environmental Impact Analysis Process (EIAP) Manager	The NEPA/EIAP Manager works with Natural resource program to ensure natural resource activities comply with NEPA and EIAP requirements.
NOAA/ National Marine Fisheries Service	Annually approves and advises on INRMP activities that affect species and/or habitats that NOAA is responsible for.
USFWS	Annually approves and advises on INRMP activities that affect species and/or habitats that USFWS is responsible for.
SCDNR	Annually approves and advises on INRMP activities that affect species and/or habitats that SCDNR is responsible for.

5.0 TRAINING

USAF installation NRMs/POCs and other natural resources support personnel require specific education, training, and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement – Training

Natural resources management training is provided to ensure that installation personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. Below are key natural resources management-related training requirements and programs for JB CHS:

- NRMs at Category I installations must take the course DoD Natural Resources Compliance, endorsed by the DoD Inter-service Environmental Education Review Board and offered for all DoD

Components by the Naval Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov)

- Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses
- All individuals who will be enforcing fish, wildlife, and natural resources laws on USAF lands must receive specialized, professional training on the enforcement of fish, wildlife, and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at FLETC. Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits
- Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement
- The DoD supported publication Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers (http://dodbiodiversity.org) provides guidance, case studies, and other information regarding the management of natural resources on DoD installations

6.0 RECORD KEEPING AND REPORTING

6.1 Record Keeping

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Management System (AFRIMS) records disposition schedule (RDS). Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook, and in referenced documents.

Installation Supplement – Recordkeeping

Record keeping pertaining to natural resources at JB CHS will comply with Air Force Manual 33-363.

6.2 Reporting

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Natural Resources Media Manager and SMS should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement – Reporting

Reporting of natural resources at JB CHS INRMP will be implemented by the JB CHS natural resources staff as part of the annual work plan (Section 10).

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

Installation Supplement – Natural Resources Program Management

The SAIA 16 U.S.C. § 670a(1)(B)) requires implementation of the INRMP. The SAIA states: "to facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States..." Therefore, once the INRMP is signed by the Installation Commander, Regional Director of the USFWS, and Director of the SCDNR, JB CHS is committing responsibility to the objectives and methodologies of the plan.

7.1 Fish and Wildlife Management

Program Overview/Current Management Practices

Fish and wildlife management actions are designed to conserve, enhance, and regulate habitat for game and non-game wildlife species. JB CHS is a category I installation. Category I installations are defined in part as having natural resources requiring protection and management. This section addresses: 1) wildlife management; 2) T&E species and natural communities; 3) game management; 4) prevention and control of wildlife damage and disease; and 5) fisheries management.

7.1.1 Wildlife Management

Wildlife management involves the implementation of general management practices to manipulate animal species and wildlife habitat to diversify and conserve wildlife populations.

Growth and development on and surrounding JB CHS will require the implementation of a variety of management practices to conserve and enhance terrestrial, aquatic and avian wildlife populations on the Installation and in the region.

7.1.1.1 Long-Term Management

Wildlife habitats will be managed to sustain wildlife resources on the Installation consistent with the military mission. Presented below are many general long-term management concepts and protective measures that apply to terrestrial wildlife habitats, both regionally and on the Installation.

JBC CHS will sustain and enhance habitats for terrestrial and avian species using various combinations of the following management concepts. These management concepts will be implemented as applicable and feasible, at the discretion of the NR manager.

Terrestrial Wildlife Management

- Preserve and regenerate hardwoods during Timber Stand Improvement and Wildlife Stand Improvement activities on the installation to provide hard and soft mast (e.g., acorns, hickory nuts, dogwood, blackgum and various berries).

- Avoid habitat fragmentation. Arbitrarily locating human-made linear and non-linear structures within wildlife areas undermines ecological processes by separating wildlife populations and may render the fragmented parcel unsustainable for wildlife.

- Maintain forest stands for different sizes, ages, and densities.

- 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 wildlife foraging efficiency.

- Continue a nesting/roosting assistance program. This effort involves retaining snags (standing dead trees) within managed forests for use by woodpeckers, owls, squirrels, bluebirds, and other cavity dwelling species; installation of artificial nesting platforms for osprey at JB CHS Weapons; and, wetland nest boxes for wood ducks. In addition, JB CHS NR personnel will provide a variety of nest boxes in areas where natural cavities are infrequent.

- Coordinate maintenance (e.g., mowing, pruning, trimming) with seasonal wildlife needs within improved, semi-improved, and unimproved areas.

- 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 additional designated wildlife areas where appropriate throughout the installation.

- Protect wetland areas that provide foraging, mating, and nesting resources for aquatic wildlife.

- Maintain food plots where appropriate to encourage species diversity. These plots will benefit both game and non-game wildlife species.

Migratory Bird Management

JB CHS Air prepared a migratory bird management plan (North Wind, 2011b, Section 15.0) to ensure that the Base is in compliance with all laws, regulations, and directives related to migratory birds. The plan identifies 628 CES/CEIE as the internal stakeholder with primary responsibility for implementation of the plan. Specific recommended action items are included in the plan. General recommendations include:

- Continue to utilize the DOD Partners in Flight database of migratory bird species of concern that are likely to occur on each installation to help determine the birds on which to focus conservation efforts.

- Identify and understand the bird conservation goals and habitat protection objectives for the installation's Bird Conservation Region.

- Develop and implement new, or modify existing inventory and monitoring programs, at appropriate scales, using national standardized protocols, to assess the status and trends of bird populations and habitats, including migrating, breeding, and wintering birds; to identify the habitat conditions needed

by applicable species of concern and understand interrelationships of co-existing species; and to evaluate the effects of management activities on habitats and populations of migratory birds.

- Establish a baseline assessment of all appropriate habitats to determine what bird species are present in which habitats during different times of the year.

- Develop and implement fire-suppression programs or measures when and where wildfires can potentially damage nesting, migration stopover, or non-breeding habitat.

- Work in conjunction with other federal and state agencies to develop reasonable and effective conservation measures for actions that affect migratory birds and their natural habitats.

- Continue to strive to reduce BASH incidents by adhering to the JB CHS BASH Reduction Program.

- Manage JB CHS lands in a manner that supports migratory bird conservation to the extent possible and consistent with the military mission.

- Involve the community (both the public and military) to increase awareness of the value and vulnerability of migratory birds.

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. Migratory birds face serious challenges, including habitat loss, collisions with artificial structures, and environmental contaminants, resulting in species decline. Because migratory birds cross the boundaries of nations, watersheds, and ecosystems, protecting them requires a coordinated effort involving multiple jurisdictions and interests.

Violations of the MBTA could include habitat modifications, shooting, pesticide application, nest or egg removal, and occasionally, tree removal. Habitat modification as a result of timber sales does not necessarily constitute a violation, but the removal of nests, eggs, and nestlings is not allowed. The Installation's NR manager will be informed before any action is taken that may affect any migratory bird species. The NR manager will determine if the possible impacts associated with the action would impact migratory bird species and, if necessary, will initiate discussions or negotiate a permit with the USFWS.

Partners in Flight (PIF) was launched in 1990 in response to growing concerns about declines in the populations of many land bird species, and in order to emphasize the conservation of birds not covered by existing conservation initiatives. The initial focus was on neotropical migrants, species that breed in the Nearctic (North America) and winter in the Neotropics (Central and South America), but the focus has spread to include most landbirds and other species requiring terrestrial habitats. The central premise of PIF is that the resources of public and private organizations in North and South America must be combined, coordinated, and increased in order to achieve success in conserving bird populations in this hemisphere. PIF is a cooperative effort involving partnerships among federal, state and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals. The DoD is one of the many federal agencies that signed a Memorandum of Agreement supporting the PIF initiative of bird conservation.

PIF's goal is to focus resources on the improvement of monitoring and inventory, research, management, and education programs involving birds and their habitats.PIF has developed Bird Conservation Plans (BCP's) for each physiographic area and/or state in the United States. These plans are among many recent efforts to address conservation of natural resources and ecosystems in the United States. They primarily address nongame landbirds, many of which are exhibiting significant declines that may be arrested or

reversed if appropriate management actions are taken. BCP's emphasizes effective and efficient management through a four-step process designed to identify and achieve necessary actions for bird conservation:

8. Identify species and habitats most in need of conservation (i.e., prioritization);

9. Describe desired conditions for these habitats based on knowledge of species life history and habitat requirements;

10. Develop biological objectives that can be used as management targets or goals to achieve desired conditions; and

11. Recommend conservation actions that can be implemented by various entities at multiple scales to achieve biological objectives.

The BCP for the South Atlantic Coastal Plain was developed for the physiographic area encompassing JB CHS (PIF, 2001). JB CHS will implement long-term migratory bird management practices in support of PIF and the Bird Conservation Plan while ensuring the Installation's military mission. In addition to the terrestrial wildlife management practices discussed above, the following practices may be implemented for migratory bird management:

- Annual monitoring for resident and transient migratory birds with emphasis on priority species to determine population trends in association with habitat management;

- Conversion of commercial pine stands back to longleaf where suitable conditions exist;

- Continue to implement a prescribed fire program on NAAF and JB CHS Weapons;

- Protection of coastal maritime forest and scrub-shrub habitats which support most of the eastern populations of painted buntings, but also are extremely important for in-transit migrants;

- Maximize foraging habitat for waterfowl and wading birds within old rice field impoundments through water level manipulation and weed control;

- Manage fields and other early successional habitats to maximize foraging and nesting habitat for grassland species such as Henslow's Sparrows; and

- Develop other management strategies for high priority species designated in the Bird Conservation Plan for the South Atlantic Coastal Plain.

On December 2, 2003, the President signed the 2003 National Defense Authorization Act. The Act provides that the Secretary of the Interior shall exercise his/her authority under the MBTA to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense.

Congress defined military readiness activities as all training and operations of the Armed Forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Congress further provided that military readiness activities do not include: (a) the routine operation of installation operating support functions, such as administrative offices, military exchanges, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, laundries, morale, welfare, and recreation activities, shops, and

mess halls; (b) the operation of industrial activities; or (c) the construction or demolition of facilities used for a purpose described in (a) or (b).

The final rule authorizing the DoD to take migratory birds during military readiness activities was published in the Federal Register on February 28, 2007 (50 CFR Part 21). The regulation provides that the Armed Forces must confer and cooperate with USFWS on the development and implementation of conservation measures to minimize or mitigate adverse effectsof a military readiness activity if it determines that such activity may have a significant adverse effect on a population of a migratory bird species. Migratory bird conservation relative to non-military readiness activities is addressed separately in a Memorandum of Understanding developed in accordance with EO 13186, signed January 10, 2001, "Responsibilities of Federal Agencies to Protect Migratory Birds."

The requirement to confer with the USFWS is triggered by a determination that the military readiness activity in question will have a significant adverse effecton a population of migratory bird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem.

The Memorandum of Understanding between DoD and USFWS was signed on July 31, 2006. DoD responsibilities discussed in the Memorandum of Understanding include, but are not limited to:

- Obtaining permits for import and export, banding, scientific collection, taxidermy, special purposes, falconry, raptor propagation, and depredation activities;
- Encouraging incorporation of comprehensive migratory bird management objectives in the planning of DoD planning documents;
- Incorporating conservation measures addressed in regional or state bird conservation plans in INRMPs:
- Managing military lands and activities other than military readiness in a manner that supports migratory bird conventions; and
- Developing, striving to implement, and periodically evaluating conservation measures for management actions to avoid or minimize incidental take of migratory birds, and, if necessary, conferring with the USFWS on revisions to these conservation measures.

JB CHS Air (including NAAF) possess migratory bird depredation permits from the USFWS and SCDNR. These permits are necessary for flight-line safety. As a condition of these permits, JBC Air submits an Annual Depredation Report that details the number and species of migratory birds taken under the permit.

7.1.2 Game Management

Game management in the context of this INRMP includes established techniques, which benefit a variety of wildlife including both game and non-game species. JB CHS will utilize effective management and monitoring techniques to sustain essential habitat and populations of game (e.g., white-tailed deer, wild turkey, and waterfowl) species in areas consistent with the military mission. Because there are different military missions for each JB CHS installation, game management techniques also differ. While BASH is a significant concern and greatly affects game management at JB CHS Air and NAAF, it is not a concern at JB CHS Weapons because there are no flight activities associated with JB CHS Weapons. Additionally, as noted below, hunting is allowed at NAAF and JB CHS Weapons, but not at JB CHS Air.

7.1.2.1 Long-Term Management

White-Tailed Deer Management

JB CHS Air: Both JB CHS Air and NAAF have occasional instances of airfield encroachment from white-tailed deer and currently possesses depredation permits from the SCDNR. USDA APHIS serves as the BASH contractor at JB CHS Air and NAAF and conducts deer depredation as required. Deer are discouraged from JB CHS Air and NAAF by fencing, harrassment techniques, and habitat reduction (i.e., removing suitable cover from the airfield area by removing shrubs and other tall vegetation). Deer are depredated on a regular basis to keep populations low. As noted in Section 7.1.3, hunting is not allowed on JB CHS Air. Deer hunting is allowed at NAAF, but it is limited to the large forested area in the southern portion of the installation.

JB CHS Weapons: As previously mentioned there are no BASH issues associated with wildlife at JB CHS Weapons because there are no flight activities on the installation. Therefore, JB CHS Weapons will strive to improve herd condition, maintain deer populations at acceptable levels, and increase the quality of individual deer (higher weights for both sexes and more antler points on bucks). SCDNR biologists recommend keeping the fawn (less than 1.5 years old) and young antlered buck harvest low and harvest adult does in moderation based on population objectives. Many factors including habitat changes, harvest, and fawn predation by coyotes can play a significant role in determining deer populations.

Deer herd management will consist primarily of habitat enhancement and harvest quotas. Deer harvest data is compiled at the game check station and will be kept to monitor the condition of the herd. Habitat enhancement will be accomplished through timber management practices including thinnings, reforestation, and final harvests. Prescribed burning of selected areas, on a 3-5 year rotation, will be emphasized since this is the most effective and economical means of improving deer habitat. Forest openings, created by power-line right-of-ways, roads, magazine demolitions, logging decks and wildlife openings will be maintained. Some openings will be planted while others will be maintained by burning, disking, or mowing. Fruit and mast producing trees and shrubs will be planted and protected when funding and manpower is available.

Wild Turkey Management

JB CHS Weapons: Wild turkeys respond favorably to many techniques employed for deer, songbirds, quail and a variety of other species. The most feasible management practices on the Installation for turkey are prescribed burning on a three to five year schedule and thinning operations. This will improve turkey habitat by keeping an open understory, while encouraging development of fruit and mast-bearing species. Maintenance of an open understory, with adequate ground-story grasses and legumes and preservation of hardwood mast-producing trees, is the long-term goal. Seasonal turkey hunting limits are established on an annual basis by the natural resources manager to help maintain population numbers. Please refer to section 7.1.3 for a description of the hunting program at JB CHS.

Bobwhite Quail Management

JB CHS Weapons: The primary long-term management factors for managing bobwhite quail are provisions for food and cover for nesting and brood rearing habitat. Quail management practices correspond closely to those identified above for deer and turkey. An open over-story is the most important component of quail habitat. Carrying capacity of forested areas are increased primarily through timber harvesting and prescribed burning. Pine forests managed for quail can usually support one covey to each 25-100 acres. Another component for effective quail management is the establishment of cover, because of its

significance during each life stage of the quail. Therefore, establishing hedgerows and brush piles with native vegetation, in close proximity to food, is a high management priority.

Waterfowl Management

JB CHS Weapons: A number of species of waterfowl occur, or potentially occur, on JB CHS Weapons. The most prominent species are wood duck, ring-necked duck, blue-winged teal, and green-winged teal. Northern shoveler, hooded merganser, mallard, ruddy duck and lesser scaup. Other species are occasionally seen.

Waterfowl use of some impoundments is limited due to encroachment by aquatic pest-plants that displace more desirable native plants and reduce open water areas. Existing dikes and water control structures, as well as water quality, will be maintained. Where feasible, encroachment of aquatic pest plants will be discouraged. Desirable waterfowl foods, such as water shield, pondweed, sedges, and smartweed, will be encouraged. The ongoing wood duck nest box program will be continued in ponds providing optimum wood duck brood rearing habitat.

7.1.3 Hunting and Fishing Program

JB CHS provides a comprehensive hunting and fishing program. Over 1,000 hunting and fishing permits were issued by JB CHS during the 2018-2019 hunting season. 230 hunters went on 1,972 deer hunts and harvested 147 deer and 43 turkey hunters went on 145 hunts and bagged 8 wild turkeys. Small game and waterfowl hunters, as well as fisherman, also widely utilized hunting opportunities at JB CHS. In total, approximately 10,094 hunting and fishing hours were logged during the 2018-2019 season.

The hunting and fishing program at JB CHS is designed to meet two objectives:

1. Provide recreation opportunities to authorized individuals in accordance with all applicable state and federal regulations; and

2. Ensure protection of the Installation's valuable natural resources.

Hunting and fishing opportunities and regulations at JB CHS are described in JB CHS Hunting and Fishing Program Plan (Section 15.0). Air Force Security Forces personnel, JB CHS NR personnel, and JB CHS volunteer game wardens are authorized to enforce Installation hunting and fishing policies and procedures, in accordance with AFI 32-7064, 6.4.2: *Fish and Wildlife Law Enforcement by Air Force Personnel*. The commander may designate fish and wildlife law enforcement authority to military or civilian personnel only if the person has either been certified in conservation law enforcement through training at FLETC or by commission as a fish and wildlife conservation officer in the state where the installation is located. Law enforcement personnel who do not possess either federal or state fish and wildlife enforcement certification can be used to supplement fish and wildlife law enforcement under the supervision of certified personnel. Additional information on conservation law enforcement is found in Section 7.3.

Hunting and fishing are currently allowed on the Northside, Marrington, Eastside Unrestricted, Southside (bow only), and MenRiv (bow only) Hunt Areas of JB CHS Weapons, and at selected areas on NAAF. Hunting is not allowed anywhere on JB CHS Air. All hunting and fishing activities are conducted in accordance with federal and state laws and regulations. Portions of JB CHS Weapons are open to hunting and fishing by the general public, but NAAF (and restricted areas on JB CHS Weapons) are open only to DoD employees and military retirees. This includes all military and civilian employees and dependents who possess Common Access Cards (CAC) or retired military ID or retired DoD employee ID.

Hunting for the following species is allowed at JB CHS Weapons: white-tailed deer, wild hog, wild turkey, bobcat, rabbit, bobwhite quail, grey squirrel, beaver, coyote, fox and migratory game birds. Only white-tailed deer and wild turkey can be hunted at NAAF.

Hunting and fishing fees are collected solely to support the hunting and fishing program at JB CHS. The fee for a JB CHS Hunting Permit is $40, a JB CHS Fishing permit is $15, and a combination hunting and fishing permit is $50. Anyone hunting and fishing on JB CHS must have all required state and federal licenses and permits, and hunters must provide proof of a completed state-approved safety course (JB CHS offers several of these courses annually).

All hunting seasons are the same as those established by SCDNR for state Game Zone 3. Specific dates and hunt hours are set by the NR manager and published in a Hunting Schedule available at the NR Office and posted at Hunter Check Station. The schedule is subject to periodic revision, depending on mission requirements. Due to mission impacts the hunt schedule at NAAF is especially dynamic and is e-mailed to interested hunters on a weekly basis. Contact base NR offices to be included on that distro list.

7.2 Outdoor Recreation and Public Access to Natural Resources

Program Overview/Current Management Practices

In accordance with the Sikes Act and AFI 32-7064, the NR staff at JB CHS strives to promote and develop sustainable recreational opportunities in a manner compatible with the military mission and subject to safety and security requirements.

It is a goal of the NR staff to provide quality and affordable outdoor recreational opportunities to JB CHS affiliated personnel and local communities for their benefit and enjoyment.

Degree of Public Access

AFI 32-7064 requires installations with unimproved lands identify in the INRMP the availability of lands, by access category, for hunting, fishing, trapping and other dispersed outdoor recreation activities. Access categories are detemined based on mission security requirements and safety concerns. There are three basic access categories:

Open Areas: Unrestricted areas on the installation where hunting, fishing, and natural resource based outdoor recreation are permitted to all participants.

Restricted Areas: Areas designated by the commander where recreational hunting, fishing, and other natural resources based outdoor activities are permitted to certain categories of participants or under special arrangements as defined by the commander.

Off Limits Areas: Areas designated by the commander as being off limits to recreational hunting, fishing, and natural resource based outdoor recreation by any person at any time. These are areas where mission security and safety concerns will not allow such use.

Table 7-1 provides the acreages of the access classifications at JB CHS: Air Base, NAAF, and Weapons.

Table 7-1. Access categories at Joint Base Charleston for areas suitable for outdoor recreation

Outdoor Recreation	Acreage of Joint Base Charleston Installations

Access Category	Air Base	NAAF	Weapons
Open	0	0	1,480
Restricted	10	1,150	5,810
Off Limits	3,994	1,250	8,707
Total Acres	4,004	2,400	15,997

Air Base

There are no areas on JB CHS Air that are open to the general public for outdoor recreation. This is due to the lack of suitable areas for outdoor recreation at JB CHS Air that are sufficiently removed from mission-sensitive areas. There is a one-mile nature trail, currently being extended, that is open to CAC holders. Hunting is allowed on designated areas on NAAF but access is restricted to CAC holders, military retirees and their dependents and retired DoD employees. This restriction is due to the lack of personnel to provide oversite for safety and security at NAAF.

Weapons Station

JB CHS Weapons provides high quality outdoor recreational activities for the general public, DoD Civilians, military, and their dependents within the constraints of security and safety necessary for the military mission. Resources available include: five major picnic areas, a six mile jogging/skating/street biking trail, a 22-mile mountain biking trail, a horse stable, hunting areas, fishing piers, boat ramps, and a "primitive" camping area for Scouting Groups. No recreational off-road driving or ATV use is permitted. The JB CHS Watchable Wildlife Area features two wildlife observation towers, five wetland boardwalks, and 2 miles of associated walking trails. Four brochures are available to the public to facilitate area use.

The 1,480 acre Marrington tract is open to the general public for outdoor recreational use and supports the majority of the Installation's outdoor activities. An Outdoor Recreation Pass program was instituted in 2004 to facilitate public (non-DoD ID holders) access to the Marrington Outdoor Recreation Area. The fee for this required annual pass is $20. In the Northside Area 4,767 acres are open to the public for hunting. Due to safety and security concerns 745 acres in the Eastside Unrestricted Area and the 298 acres in the Southside Area are open to CAC holders, military retirees and their dependents and retired DoD employees only. Again, due to safety and security concerns, the Eastside ordnance storage area is not open for any for recreational activity what-so-ever.

7.3 Conservation Law Enforcement

Program Overview/Current Management Practices

The State of South Carolina has jurisdiction over resident fish and wildlife throughout the state, including JB CHS. The SCDNR, which was organized in its present form in the 1994 South Carolina Restructuring Act, is the governmental body responsible for the conservation of resident fish and wildlife. As such, the SCDNR establishes rules, regulations and season dates governing the taking of resident fish and wildlife.

The USFWS has jurisdiction over migratory birds, federal T&E species, certain marine mammals, and freshwater and anadromous fish. JB CHS is required to comply with federal fish and wildlife laws such as the ESA, which prohibits the unauthorized taking of federally listed T&E species. The Act requires federal agencies conserve these species and consult with USFWS on actions that may affect them.

The 628th Security Forces Squadron (628 SFS) is the sole JB CHS organization tasked with law enforcement responsibility. However, the Sikes Act specifies that each installation's INRMP "shall, to the extent appropriate and applicable, provide for enforcement of applicable natural resources law including regulations." AFI 32-7064 states that the Commanding Officer of the installation or persons may designate fish and wildlife law enforcement authority to military or civilian personnel only if the person has either been certified through training at the FLETC or by commission as a fish and wildlife conservation officer in the state where the installation is located. Law enforcement personnel who do not possess either federal or state fish and wildlilfe enforcement certification can be used to supplement fish and wildlife law enforcement under the supervision of certified personnel.

JB CHS NR personnel and JB CHS volunteers are authorized to enforce the policies and procedures laid out in JB CHS Hunting and Fishing Program Plan (Section 15); they are not authorized to enforce state or federal laws. Violations of state or federal game laws are reported to the 628 SFS and to appropriate state or federal officers. Violations of policy, procedure or conservation laws at JB CHS may result in suspension or non-refundable revocation of hunting/fishing privileges.

7.4 Management of Threatened and Endangered Species, Species of Concern, and Habitats

Program Overview/Current Management Practices

Based on scientific and commercial data species are listed as endangered or threatened if there is current or threatened habitat loss, disease, over-exploitation, or other factors affecting its existence. The ESA was federally mandated in 1973 to provide a means to conserve endangered and threatened species and the habitats on which these species depend.

The ESA also prohibits federal agencies from authorizing, funding, or carrying out any actions that destroy or adversely modify "critical habitat." Critical habitat for a threatened or endangered species is defined as: (1) the specific areas within the geographical area occupied by the species at the time it is listed as threatened or endangered on which are found physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and (2) specific areas outside the geographical areas occupied by the species at the time it is listed, upon a determination by the Secretary of Interior that such areas are essential for the conservation of the species. Critical habitat is legally defined and published in the Federal Register pursuant to species listing as endangered or threatened under ESA. Additionally, the South Carolina Endangered and Threatened Species Act was state legislated to provide additional protection to T&E species.

Federal Species of Concern are not legally protected by the ESA but are under consideration for future listing by the USFWS. Likewise, candidate species are not legally protected by the ESA. Candidate species are those for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act (ESA), but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Therefore, the USAF manages for species of concern and candidate species as budget considerations and military mission allow.

Federally or state-listed species as well species of concern that occur or may occur on JB CHS (Section 7.4) have been identified as conservation priorities and require special management and protection efforts detailed below. Changes in management practices may result from: 1) the listing of a new species for protective status or the removal of a species from the list; or 2) a change in the species distribution found to occur on the Installation. JB CHS will continue to conduct T&E species surveys to identify new species and monitor changes in species populations and habitat. Species information provided by the surveys will be used to modify management practices. Management practices will be modified by the NR manager in consultation with USAF foresters and biologists, as well as other federal and state agencies.

JB CHS has implemented, or is in the process of implementing, a number of projects that provide direct and indirect benefits to federally or state-listed species, species of concern, and their habitats (Table 7-2). These projects have or will occur on all three JB-CHS locations. The projects listed below have or will have direct beneficial impacts on water quality in the Cooper River. These benefits include reductions in nutrient and sediment discharge to the Cooper River and tributaries. The complete list follows:

- Demolition of Pier Charlie, which extended into the Cooper River at JB CHS Weapons
- Repairing/revitalizing the storm water drainage systems on portions of NAAF and Air and Weapons;
- Updating the SWPPP and SWMP at JB CHS Weapons;
- Improving/repairing drainage conditions at Wharf Alpha at JB CHS Weapons;
- Repairing forestry roads and culverts at JB CHS Weapons;
- Managing wildland fire at JB CHS Weapons;
- Including Performance-Based Goals in the Grounds Maintenance contract that allows grass heights of up to 14" in riverfront areas. This limits mowing to approximately once per month during the growing season and helps to minimize erosion and sediment transport to the river;
- Correcting erosion issues at the Grace Hopper Bridge (the bridge spans Goose Creek near its confluence with the Cooper River);
- The NPTU expansion, which provided mitigation to minimize impacts to shortnose and Atlantic sturgeon by limiting the times during which in-water work could be performed to periods when the sturgeons would not likely be present (i.e., April 1-September 30);
- Storm water sampling at both JB CHS Air and Weapons; and
- Aquatic invasive species management adjacent to the Cooper River.

Table 7-2. JB CHS accomplishments related to federally or state-listed species, species of concern, and their habitats FY14-FY19

FY	Project #	Project Name	Programmed or Awarded Amount	Location	Type of Benefit
FY14	DKGV 12-2132	Repair Forestry Roads and Culverts	$136, 739.90	W	Direct (1,2)
FY14/15	SBML 11-1120 (Companion)	Repair Off-Site Outfall Drainage Ditch, NAAF	$65,000	NAAF	Direct (1,2)
FY14	N69450-14-C	NPTU Pier Expansion (IX-516 Normal Mooring Construction)	$1,684,417.00	W	Direct (4)

FY14	DKFX 14-5010	(A/E) Mgt, Wetlands/Floodplain	$50,000.00	NAAF	Indirect
FY14	DKFX 15-5020 (Companion)	Mgt, Wetlands/Floodplain	$35,000	NAAF	Direct (1,2)
FY15	DKFX 14-5005	Mgt, Invasive Species (Aquatic)	$60,000.00	W	Direct (1,2)
FY15	DKFX 14-5002	Mgt, Species, T&E	$35,000.00	W	Direct
FY15	DKFX 14-5006	Mgt, Wildland Fire	$20,000.00	W	Indirect
FY15	DKFX 14-5007	Mgt, Habitat, Wildlife	$5,000.00	W	Indirect
FY15	DKGV 11-2024	(A/E) Repair Erosion at Grace Hopper Bridge	$30,000.00	W	Indirect
FY15/16	DKGV 11-2024 (Companion)	Repair Erosion at Grace Hopper Bridge	$45,000	W	Direct (1,2)
FY16	DKFX 30-3466	Sampling, Storm Water	$10,000	A, W	Indirect
FY16	DKFX 15-3466	Sampling, Storm Water	$10,000	A, W	Indirect
FY16	DKFX 15-5005	Mgt, Invasive Species (Aquatic)	$60,000	W	Direct
FY16	DKFX 14-5007	Mgt, Habitat, Wildlife	$4,000	W	Indirect
FY17	DKFX 15-5020	Mgt, Wetlands/Floodplain	$35,000	NAAF	Direct
FY17	DKFX 15-5005	Mgt, Invasive Species	$39,000	W	Direct
FY17	DKFX 14-5007	Mgt, Habitat, Wildlife	$5,000	W	Indirect
FY17	DKFX 15-3466	Sampling, Storm Water	$10,000	A,W	Indirect
FY18	DKFX 15-5005	Mgt, Invasive Species	$35,000	W	Direct (1,2)
FY18	DKFX 15-5005	Invasive Species Mgt Plan	$60,000	W	Direct (1,2)
FY18	DKFX 30-3466	Sampling, Storm Water	$10,000.00	A, W	Indirect
FY18	DKFX 14-5007	Mgt, Habitat, Wildlife	$9,000	W	Indirect
FY19	DKFX 30-3466	Sampling, Storm Water	$10,000	A,W	Indirect
FY19	DKFX 15-5005	Mgt, Invasive Species	$60,000	W	Direct (1,2)
FY19	DKFX 15-5005	Repair Forestry Roads, Culverts (Forestry)	$100,000.00	W	Direct (1)

FY19	DKFX 15-5005	Plan Update, INRMP	$100,000.00	JB CHS	Indirect
FY19	DKFX 14-5007	Mgt, Habitat, Wildlife	$4,500	W	Indirect
Annual		Grounds Maintenance	Not Available	A, W	Direct (1)

A=JB CHS Air W=JB CHS Weapons NAAF=North Auxiliary Airfield

Key to Atlantic sturgeon benefits: 1 = reduce nutrient, sediment, and/or pollutant discharge; 2 = increase dissolved oxygen; 3 = reduce substrate disturbance; 4 = de-conflict work relative to migration patterns; 5 = reduce intrusion into habitat.

7.4.1 Air Base

The most recent survey for threatened and endangered species on JB CHS Air was conducted in 2011and included in Appendix 14.2. No federally listed T&E species are resident on JB CHS Air Base or NAAF.

Individual wood storks (federally threatened and state endangered) and bald eagles (state listed threatened) have been observed. No nesting habitat is present for either species on either base. Management for both of these large bird species will consist of discouraging them from entering the airfield area to avoid BASH incidents. Federal Species of Concern found on JB CHS Air include loggerhead shrike and painted bunting.

Wood Stork

Status. Endangered – State; Threatened –Federal

Habitat Use and Requirements. Storks feed on small fish in freshwater and brackish wetlands, including freshwater marshes, flooded pastures, and ditches. Particularly attractive feeding sites are depressions in marshes or swamps, and any other area where fish become concentrated during periods of falling water levels. The storks will travel up to 80 miles between rookeries and feeding areas. Nests are usually constructed in the upper branches of large cypress trees. Breeding occurs in February through April.

Habitat Conditions. JB CHS Air has a network of ditches that could provide potential feeding habitat.

Limiting Factors. Wood stork decline is the result of loss of suitable feeding habitat and rookery sites.

Installation Status. Occasional visitor.

Management. Continued maintenance of existing wetland habitats and ditches attractive to wood storks

Bald Eagle

Status. Threatened – State. The bald eagle is protected under the Bald and Golden Eagle Protection Act (BGEPA), as well as the MBTA. Both of these regulations require protection of eagles and compliance in accordance with Draft Eagle Conservation Plan Guidance provided by the USFWS in January 2011.

Habitat Use and Requirements. Bald eagles are primarily associated with coasts, rivers, and lakes, usually nesting near bodies of water. They are opportunistic feeders and taking a variety of vertebrate prey, both living and carrion, depending on locality and availability. When fish are abundant they are the major part of the eagle's diet. In South Carolina, breeding season is in the late winter. Nests are usually located in the tops of tall, living trees. Nest site prerequisites generally include:

- Proximity to water: usually within a half mile (0.8 km), with a clear, short flight path to it;

- The largest/tallest tree in the stand;
- An unobstructed view of the surrounding area;
- Proximity of good perching trees; and
- Acceptable levels of human activity.

Habitat Conditions. Suitable habitat roosting and nesting areas for bald eagles does is marginal on the installation. The adjecent Ashley River provides some feeding habitat.

Limiting Factors. Human disturbance during nesting, illegal shooting, loss of nest trees, collisions with wind turbines, and electrocution by power lines are the primary limiting factors.

Installation Status. Occasional visitor.

Management. Continued protection of riparian areas

Loggerhead Shrike

Status. Species of Concern - Federal.

Habitat Use and Requirements. The loggerhead shrike is a permanent resident found statewide in South Carolina, except at higher elevations. It is most abundant in the Coastal Plain, especially within the farm belt of the Inner Coastal Plain. Loggerhead shrikes use open grass lands, old fields, orchards, grassy roadsides, cultivated fields and pasture. This bird nests in hedgerows, shrubs and trees, notably red cedar (*Juniperus virginiana*), but will also utilize loblolly pine (*Pinus taeda*) and live oak (*Quercus virginiana*). Nest trees and shrubs are typically in the open. Loggerhead shrikes hunt from power lines, exposed tree limbs, fence posts and other conspicuous perches. Thorn trees, barbwire or other sharp objects are necessary within the habitat; the loggerhead shrike uses these to impale and cache prey. The loggerhead shrike feeds mainly on large insects and small rodents though it will, at times, take smaller birds.

Habitat Conditions. The habitat surrounding the airfield currently provide near-ideal habitat for loggerhead shrike due to the perching locations provided by fencing and the open nature of the area. The habitat will likely maintain favorable characteristics during the operation of the Base.

Limiting Factors. The loggerhead shrike has experienced declines over significant portions of its range in the eastern part of the state, especially within the Piedmont bird conservation region. South Carolina has experienced an annual decline of 3.6 percent from 1966 through 2000. To date, the current estimated state population is 46,500 individuals (http://www.dnr.sc.gov/cwcs/pdf/Grasslandbirds.pdf). At JB CHS Air,

Installation Status. Resident.

Management. The primary enhancement measure JB CHS could initiate immediately is discouraging access to habitats during the breeding/nesting season (mid-Feb to June). Additionally, any construction or clearing of nesting trees should be prohibited in these areas as mission and flightline safety allow. In the mowed areas, control mowing to increase areas of taller grass (≥20 cm) (Prescott and Collister 1993, Collister 1994, Yosef 1996) as the mission allows. Although loggerhead shrikes prefer to forage in short grass, foraging success may be higher in tall grass areas, where vertebrate prey abundance is higher (Collister 1994).

Painted Bunting

Status. Species of Concern - Federal.

Habitat Use and Requirements. Buntings are found in thickets, woodland edges with riparian thickets, shrubbery and brushy areas. In the East, the species breeds in maritime habitats and scrub communities. It is often found along roadsides and in suburban areas, and in gardens with dense, shrubby vegetation.

Habitat Conditions. The habitat south and southeast of the airfield currently provide near-ideal habitat for painted bunting due to the varied vegetative structure of these areas. Scattered trees, with interspersed open patches and dense shrubby areas, characterize both habitats.

Limiting Factors. Populations are primarily declining due to habitat being lost to development, especially in coastal swamp thickets and woodland edges in the east and riparian habitats in migration and winter in the southeastern U.S. and in Mexico.

Installation Status. Resident.

Management. The habitats will likely maintain favorable characteristics for five to ten years without intervention by JB CHS. As the areas undergo succession in future years (i.e., the open grassy areas are overtaken by shrubs) the Base may consider reducing shrub coverage by conducting limited brush-hogging operations; this possibility should be evaluated during future T&E surveys.

The primary enhancement measure that JB CHS Air could initiate immediately includes discouraging access to the habitats during the breeding/nesting season (early April-late June). Additionally, any construction, clearing, or dumping of debris should be prohibited in these areas.

7.4.2 North Auxiliary Airfield

As per the 2011 survey, no federal or state listed T&E species are resident at the NAAF.

Transient T&E Species: A pair of wood storks (federally threatened and state endangered) was observed soaring over the sight during the 2011 survey. Bald eagles (state listed threatened) have been occasionally observed. Nesting habitat is marginal (eagles) or non-existent (storks) for these species at NAAF. Management will consist of discouraging them from entering the airfield area to avoid BASH incidents.

Wood Stork

Habitat Conditions. NAAF has one shallow pond that could provide potential feeding habitat.

Limiting Factors. Wood stork decline is the result of loss of suitable feeding habitat and rookery sites.

Installation Status. Unlikely visitor or resident (a pair was observed soaring overhead on one occasion)

Management. Maintenance of existing wetland habitats which may prove attractive to wood storks

Bald Eagle

Habitat Conditions. Suitable habitat roosting and nesting areas for bald eagles is marginal on the installation. The north fork of the Edisto River could serve as a feeding area.

Limiting Factors. Human disturbance during nesting, illegal shooting, loss of nest trees, and electrocution by power lines are the primary limiting factors

Installation Status. Occasional visitor

Red-Cockaded Woodpecker

Status. Endangered - State and Federal.

Habitat Use and Requirements. The basic habitat for RCW is open pine stands with a minimum age of 60 years. Longleaf pine is the preferred species but other southern pines are also acceptable. Mixed stands, with sizable hardwood components, or stands with a dense understory, are generally avoided.

Habitat Conditions. The suitable habitat at NAAF is dominated by slash pine and loblolly pine, with a component of longleaf pine. The larger pines in these stands are likely 60-70 years old, and have a DBH of 20-30 inches.

Limiting Factors. The small amount of open pine forest with 60-year old trees and older is the primary limiting factor for RCWs on this installation.

Installation Status. Unlikeley resident.RCW have never been recorded on or in the near vicinity of NAAF; the nearest recorded RCW colony is located aproximately 20 miles to the southeast.

Management. Due to the isolation of this habitat from other RCW populations no active management efforts will be taken to encourage colonization by the species.

Species of Concern

Carolina Birds-In-A-Nest

Status. Species of Concern - Federal

Habitat Use and Requirements. Populations of *Macbridea caroliniana* occur in swamp forests of blackwater floodplains and less frequently in brownwater floodplains (Leblond and Sorrie 2002). Habitat occupancy may be related to large canopy gaps, low shrub cover and/or high moss cover.

Habitat Conditions. The suitable habitat at NAAF is dominated by slash pine and loblolly pine, with a component of longleaf pine. The larger pines in these stands are likely 60-70 years old, and have a DBH of 20-30 inches.

Limiting Factors. Although specific habitat requirements for this species are not well known (i.e., it appears to occure sporadically within apparently suitable habitat), clearing of bottomland hardwoods and sediment transport into these areas are limiting factor for this species.

Installation Status. Resident. Three very small populations of this species were located during the 2011 survey. It is possible that numbers will increase during years of normal rainfall but the browsing observed on many of the stems indicates that wildlife damage may be a significant threat to this species at NAAF.

Management. Sediment encroachment into the habitat should be controlled and minimized. No activities such as dumping, dredging, or clearing should be allowed within or directly adjacent to this habitat. Pedestrian uses of the habitat, such as hunting, bird watching, and other nature activities will not have a detrimental impact on the population of Carolina birds-in-a-nest.

Loggerhead Shrike

Habitat Conditions. The habitat surrounding the airfield currently provides near-ideal habitat for loggerhead shrike due to the perching locations provided by fencing and the open nature of the area. The habitat will likely maintain favorable characteristics during the operation of the Base.

Limiting Factors. The loggerhead shrike has experienced declines over significant portions of its range in the eastern part of the state, especially within the Piedmont bird conservation region. South Carolina has experienced a decline of 3.6 percent from 1966 through 2000. To date, the current estimated state population is 46,500 individuals (http://www.dnr.sc.gov/cwcs/pdf/Grasslandbirds.pdf). At JB CHS Air, harassment techniques as part of the BASH program reduce use of suitable habitat near the airfield.

Installation Status. Possible Resident. No specimens were identified during the 2011 survey. However, one individual was observed in the 2005 wildlife survey.

Management. The primary enhancement measure JB CHS could initiate is discouraging access to habitats during the breeding/nesting season (mid February- June). Additionally, any construction or clearing of nesting trees should be prohibited in these areas as mission and flightline safety allow. In the mowed areas, control mowing to increase areas of taller grass (≥20 cm) (Prescott and Collister 1993, Collister 1994, Yosef 1996) as the mission allows. Although loggerhead shrikes prefer to forage in short grass, foraging success may be higher in tall grass areas, where vertebrate prey abundance is higher (Collister 1994).

Painted Bunting

Habitat Conditions. The habitat south and southwest of the airfield currently provide near-ideal habitat for painted bunting due to the varied vegetative structure of these areas. Few mature trees, with interspersed open patches and dense shrubby areas, characterize the habitat.

Limiting Factors. Populations are primarily declining due to habitat being lost to development, especially in coastal swamp thickets and woodland edges in the east and riparian habitats in migration and winter in the southeastern U.S. and in Mexico.

Installation Status. Resident.

Management. The habitats will likely maintain favorable characteristics for five to ten years without intervention by the Base. As the areas undergo succession in future years (i.e., the open grassy areas are overtaken by shrubs and the coppice regrowth matures) the Base may want to consider reducing shrub coverage by conducting limited brush-hogging operations; this possibility should be evaluated during future T&E surveys.

7.4.3 Weapons Station

Federally listed species known to occur on JB CHS Weapons include the American alligator, West Indian manatee, shortnose sturgeon, Atlantic sturgeon and wood stork. Species not known to occur, but potentially occurring, include the RCW, flatwoods salamander, Canby's dropwort, pondberry, and chaff seed. Information regarding these species, as well as occurring or potentially occurring state listed species, is provided below.

Red-Cockaded Woodpecker

Status. Endangered - State and Federal.

Habitat Use and Requirements. The basic habitat for RCW is open pine stands with a minimum age of 60 years. Longleaf pine is the preferred species but other southern pines are also acceptable. Mixed stands, with sizable hardwood components, or stands with a dense understory, are generally avoided.

Cavity excavation for roosting almost always occurs in living pines infected with red-heart disease. The average cavity trees are nearly 100 years old for longleaf pine, and about 80 years for loblolly and other pines. Cavity tree areas are referred to as clusters. There may be a number of cavities in a cluster, and up to seven to eight woodpeckers in the immediate area, but there will be only one breeding pair in the

group. Completed cavities in active use usually have numerous small surrounding excavations called resin wells, which exude pine sap. The birds peck the wells to keep sap flowing, probably as defense mechanism against rat snakes and other predators.

The home range for a group (a social unit) averages about 200 acres, but observers have reported home ranges running from a low of around 100 acres in good habitat to an upper extreme of more than a 1000 acres in very poor habitat. The diet consists mainly of insects including: ants, beetles, grasshoppers, wood-boring insects, and caterpillars. Seasonal wild fruits can also contribute significantly to the diet (about 16 percent to 19 percent). Nesting occurs from April through June.

Habitat Conditions. Prior to DoD ownership, the area now encompassed by JB CHS Weapons contained extensive RCW habitat. However, early timber harvests, fire exclusion, construction, and other modifications greatly reduced the original RCW habitat. Then in 1989, Hurricane Hugo destroyed most of the mature pine timber severely degrading the remaining RCW habitat.

Limiting Factors. The lack of open pine forest with 60 year old trees and older is the primary limiting factor for RCWs on the installation.

Installation Status. Unlikeley resident: A study was conducted in fall 1999 and spring 2000 to survey, monitor, and manage RCW cavity trees and forest stands at JBC Weapons. Only one male RCW was located and banded at the installation during the survey and no mating or nesting activities were observed.

A survey in 2010 did not observe any RCW. However, one cluster did show possible signs of recent RCW activity. “Cluster A had three start holes on tree A-3 with relatively un-aged wood visible. One of the start holes was enlarged and slightly rectangular.”

Management. See Red-cockaded Woodpecker Management Plan (Section 15.0), for USFWS-approved management guidelines. Also see at Appendix 14.2, Red-cockaded Woodpecker Survey Naval Weapons Station Charleston, South Carolina.

Bald Eagle

Habitat Conditions. Suitable habitat (feeding, roosting, and nesting) for bald eagles is present.

Limiting Factors. Human disturbance during nesting, illegal shooting, loss of nest trees, and electrocution by power lines are the primary limiting factors.

Installation Status. Confirmed resident

Two nests are located in the Northside area. One is in a 4-acre cypress pond (forest compartment 18, stand 10). The other just north of Foster Creek, south of the small arms firing range (forest compartment 21, stand 8). In 2016 and 2017 both nests were active. In 2018 only the Foster Creek nest was active.

Management. Individual bald eagle pairs exhibit considerable variation in response to human activity depending in part upon: the type, frequency, and duration of activity; extent of modification of the environment; time in the bird's reproductive cycle; and various other factors not well understood. It cannot be predicted with certainty the effects a given activity might have on a particular pair of bald eagles. However certain human activities are known to disturb bald eagles more than others. Therefore, the following management practices will be followed.

- Territory Management Zone. An area called a Territory Management Zone (TMZ) will be designated, and kept disturbance-free during the eagle's reproductive period. The TMZ shall have a minimum

radius from the nest tree of 1,500 feet. Routine activities within the TMZ, ongoing when the nest site was chosen (e.g., roads, recreation, golfing, hunting), may continue at normal levels. However, consultation with the USFWS may be required in some circumstances. New roads and/or construction in a TMZ will require consultation with USFWS prior to the beginning of construction.

- TMZ Management. The TMZ will be managed for the benefit of the eagles. Existing nest trees will be protected and suitable replacement nest trees will be managed by timber thinnings that encourage development of mature, large-crowned pine and cypress. No tree cutting will occur closer than 375 feet to the nest tree, unless thinnings are specifically prescribed by a wildlife biologist to improve nesting habitat.

- Inactive Nests. If the nest becomes inactive, the TMZ will be evaluated by a wildlife biologist every three years. Under no circumstances will a nest tree be cut while a nest is present, regardless of when the eagle last used the nest.

- Annual Survey. An mid-winter, nation-wide survey for eagles is administered annually by the USFWS and interested organizations. Installation personnel will participatein this effort and will independently monitor active nests on the Installation.

- USFWS Guidelines. For additional information regarding bald eagle management see the Draft Eagle Conservation Plan Guidance provided by the USFWS in January 2011.

American Alligator

Status. Threatened by similarity of appearance - Federal and State.

Habitat Use and Requirements. The alligator inhabits river systems, canals, lakes, swamps, bayous, and coastal marshes. Alligators eat anything of suitable size, including mammals, amphibians, birds, reptiles and fishes. Mating and nesting occurs in late spring or early summer.

Habitat Conditions. There is abundant alligator habitat on the Installation.

Limiting Factors. In past years illegal hunting and destruction of wetlands were major factors contributing to declining populations of this species. Protection from illegal hunting has resulted in a resurgence of the alligator populations throughout the Southeast.

Installation Status. Confirmed resident

A common inhabitant present in all waters, of any size, on the Installation.

Management. Best management for the alligator will be preservation and maintenance of open water areas and adjacent wetlands. Signs will be posted to discourage the illegal feeding and harassment.

Captive Alligator. A "Permit To Possess Alligator in Captivity" has been issued by the SCDNR for the Installation to possess in captivity the alligator known as "Charlie". Charlie is located in a small fenced-in pond on Southside near Remount Road. This permit letter is on file at the NR office.

West Indian Manatee

Status. Endangered – State; Threatened –Federal.

Habitat Use and Requirements. Manatees are found in both salt and freshwater habitats 5 feet or more in depth throughout their range including: canals, sluggish rivers, estuarine habitats and salt water bays. During the coldest winter months manatees generally migrate to the southern half of Florida. During the summer months manatees become more dispersed with some individuals moving north and west along the Atlantic and Gulf coasts to Virginia and extreme western Florida. West Indian manatees feed on aquatic vegetation.

Habitat Conditions. The Cooper River estuary is suitable manatee habitat during summer months.

Limiting Factors. Heavy mortality occurs from accidental collisions with boats and barges and from canal lock operations. Another closely related factor in the decline has been the loss of suitable habitat due to incompatible human water traffic.

Installation Status. Seasonal visitor.

Manatees are regularly seen in South Carolina. Numerous manatee sightings have been made in the Charleston area including a number in the Cooper River adjacent to the Installation.

Management. Promote public awareness of the potential for manatees in Installation waters with a goal of preventing any boat/manatee collisions from occurring as a result of Installation activities. Where boat speeds, and use can be controlled, such action will be taken. Sightings of manatees will be reported to the SCDNR.

Wood Stork

Status. Threatened - State and Federal

Habitat Conditions. The Weapons Station's shallow ponds and marshes provide potential feeding habitat.

Limiting Factors. Wood stork decline is the result of loss of suitable feeding habitat and rookery sites.

Installation Status. Regular visitor.

Historical nesting areas were confined to Florida. However, in recent years, the birds have expanded nesting activity to several southeastern states. South Carolina's nesting populations are increasing, and the potential for wood storks to move into this area is significant. To date, frequent flyovers and regular feeding have been documented on the Installation.

Management. Maintenance of existing wetland habitats which may prove attractive to wood storks.

Shortnose Sturgeon

Status. Endangered - State and Federal.

Habitat Use and Requirements. During the winter and early spring, December through April, non-spawning shortnose sturgeon remain in lower estuaries of rivers, where salinities range from five to 30 parts per thousand. Both male and female spawners migrate upstream in January and February, spawning in February, March, and April. Spawning usually occurs over gravel, rubble, cobble or large rocks, timber, or scoured clay. During the warmer months, May through August, adult shortnose congregate in summer feeding areas near the salt/fresh water interface seeking snails, amphipods and other bottom-dwelling animals, abundant in the low-salinity (one to three parts per thousand) portions of the estuary.

Habitat Conditions. The estuarine waters of the Cooper River provide feeding habitat for the sturgeon.

Limiting Factors. Many favored spawning rivers (Santee, Cooper, and Savannah) have been dammed. Others (Black, Waccamaw, Pee Dee, Combahee and Edisto) have been adversely affected by pollution (industrial, agricultural, sewage, siltation, etc.). It is believed shortnose sturgeons are highly selective in their food and habitat preferences and are unable to adjust if preferred habitat is destroyed or polluted.

Installation Status. Likely resident.

Shortnose sturgeon are known to occur in the Cooper River estuary.

Management. JB CHS Weapons has implemented a number of management activities to improve or maintain habitat quality for the benefit of shortnose sturgeon. These management activities improve water quality by identifying, correcting, or preventing pollution or sediment discharges; limiting substrate disturbance; maintaining dissolved oxygen content by reducing nutrients entering the water that result in an increased biological oxygen demand from organisms processing the nutrients; and maintaining or improving water clarity by reducing erosion and limiting sediment in runoff. These activities include:

Water Resources Protection (Section 7.5):

- Implementing BMPs to improve the quality of water discharged from JB CHS Weapons into the Cooper River and tributaries. These BMPs include training, public awareness and participation, identifying and correcting illicit discharges, ensuring enforcement of erosion and sediment controls, ensuring acceptable post-construction water flow and quality, inspecting construction BMPs for proper implementation and maintenance, developing site-specific BMPs, and routinely inspecting and maintaining the storm water system. These BMPs directly benefit the shortnose sturgeon by reducing pollution and sediment discharges and maintaining dissolved oxygen levels.

- Limiting dredging operations of the NPTU ship channel and shipping and receiving facility berthing locations on the Cooper River to the minimum extent required to support those missions. This will benefit the shortnose sturgeon by limiting disturbance to the substrate.

- Limiting dredging operations to periods when shortnose sturgeon are unlikely to be present in the Cooper River (i.e., April 1-September 30). This will benefit the shortnose sturgeon by reducing the potential impact to habitat when the fish are migrating in the vicinity of JB CHS Weapons.

- Initiating consultation with the NOAA-NMFS prior to conducting activities in the Cooper River that may affect the shortnose sturgeon.

- Ensuring that all construction activities in the Cooper River comply with the 23 March 2006 NOAA-NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions*, which are also applicable to Atlantic sturgeon.
- Mantaining and upgrading un-improved and improved access roadbeds, ditches and culvert systems to minimize eroision and resulting sediment which lowers water quality.

Wetland Protection (Section 7.6):

- Maintaining and/or developing protective buffer strips or corridors of designated widths where feasible around wetlands and along streams. As a general guideline, a minimum 50-foot buffer will be left undisturbed adjacent to permanent streams and natural forested wetlands. These buffers will benefit the sturgeon by reducing pollution and sediment discharges and maintaining or improving dissolved oxygen levels.

Forest Management (Section 7.8):

- Practicing ecologically-sound forest management practices leading to production of quality forest products, watershed protection, outdoor recreation opportunities, and wildlife habitat protection and management. These practices will benefit the sturgeon by limiting sediment and pollution transport to the Cooper River and its tributaries.

Integrated Pest Mangement Program (Section 7.11):

- Controlling exotic invasive plant species occurring adjacent to the Cooper River. This allows for native species to vegetate treated areas resulting in general habitat improvement for the sturgeon.

Coastal Zone and Marine Resources Mangement (Section 7.13):

- Conducting a Coastal Zone Consistency Review for projects that either disturb greater than one acre or disturb greater than ½ acre and are located within ½ mile of a state coastal receiving water. This ensures pollution and sediment discharge to Cooper River and tributaries is limited.

JB CHS will provide educational information describing shortnose and Atlantic sturgeon and providing information on how to report dead or captured sturgeon at piers, waterways, and other recreational facilities near the Cooper River. JB CHS will distribute educational brochures about sturgeon at natural resource outreach events.

Atlantic Sturgeon

Status. Endangered – State and Federal.

Habitat Use and Requirements. Because of the highly migratory nature of the Atlantic sturgeon they require access to an expansive variety of high quality freshwater and marine habitats. Within South Carolina waters adult Atlantic sturgeon migrate through nearshore Atlantic shelf waters and enter coastal sounds, bays and inlets to access the river basins for spawning. They spawn in freshwater channel habitats that extend from tidal river reaches to at least as far inland as the fall line in large, unobstructed river basins. Eggs are adhesive and successful spawning is dependent upon the availability of relatively clean, hard substrates within river channels for egg adhesion and development. During the fall and winter sturgeon move seaward into brackish and estuarine channels. The Atlantic sturgeon overwinters in deep channels and holes within coastal sounds and bays. It is during such seaward migrations that Atlantic sturgeon may transfer into other river basins by traversing coastal Atlantic continental shelf waters.

Habitat Conditions. The estuarine waters of the Cooper River in the vicinity of JB CHS Weapons provide potential foraging habitat as well as a migration pathway to the Pinopolis dam (located approximately 30 miles upstream of JB CHS Weapons), below which they attempt to spawn (Federal Register 2012).

Limiting Factors. Many favored spawning rivers (Santee, Cooper, and Savannah) have been dammed. Others (Black, Waccamaw, Pee Dee, Combahee and Edisto) have been adversely affected by pollution (industrial, agricultural, sewage, siltation, etc.). It is believed Atlantic sturgeons are highly selective in their food and habitat preferences and are unable to adjust if preferred habitat is destroyed or polluted.

Installation Status. Likely migrant or occasional visitor.

Atlantic sturgeon are known to occur in the Cooper River estuary.

Management. JB CHS Weapons has implemented a number of management activities to improve or maintain habitat quality for the benefit of Atlantic sturgeon. Management activities would improve water quality by identifying, correcting, or preventing pollution or sediment discharges; limiting substrate

disturbance; maintaining dissolved oxygen content by reducing nutrients entering the water that result in an increased biological oxygen demand from organisms processing the nutrients; and maintaining or improving water clarity by reducing erosion and limiting sediment in runoff. These activities include:

Water Resources Protection (Section 7.5):

- Implementing BMPs to improve the quality of water discharged from JB CHS Weapons into the Cooper River and tributaries. These BMPs include training, public awareness and participation, identifying and correcting illicit discharges, ensuring enforcement of erosion and sediment controls, ensuring acceptable post-construction water flow and quality, inspecting construction BMPs for proper implementation and maintenance, developing site-specific BMPs, and routinely inspecting and maintaining the storm water system. These BMPs directly benefit the Atlantic sturgeon by reducing pollution and sediment discharges and maintaining dissolved oxygen levels.

- Limiting dredging operations of the NPTU ship channel and shipping and receiving facility berthing locations on the Cooper River to the minimum extent required to support those missions. This will benefit the Atlantic sturgeon by limiting disturbance to the substrate.

- Limiting dredging operations to periods when Atlantic sturgeon are unlikely to be present in the Cooper River (i.e., April 1-September 30). This will benefit the Atlantic sturgeon by reducing the potential impact to habitat when the fish are migrating in the vicinity of JB CHS Weapons.

- Initiating consultation with the NOAA-NMFS prior to conducting activities in the Cooper River that may affect the Atlantic sturgeon.

- Ensuring that all construction activities in the Cooper River comply with the 23 March 2006 NOAA-NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions*, which are also applicable to Atlantic sturgeon.

- Mantaining and upgrading un-improved and improved forest access roadbeds, ditches and culvert systems to minimize eroision and resulting sediment which lowers water quality

Wetland Protection (Section 7.6):

- Maintaining and/or developing protective buffer strips or corridors of designated widths where feasible around wetlands and along streams. As a general guideline, a minimum 50-foot buffer will be left undisturbed adjacent to permanent streams and natural forested wetlands. These buffers will benefit the sturgeon by reducing pollution and sediment discharges and maintaining or improving dissolved oxygen levels.

Forest Management (Section 7.8):

- Practicing ecologically-sound forest management practices leading to production of quality forest products, watershed protection, outdoor recreation opportunities, and wildlife habitat protection and management. These practices will benefit the sturgeon by limiting sediment and pollution transport to the Cooper River and its tributaries..

Integrated Pest Mangement Program (Section 7.11):

- Controlling exotic invasive plant species occurring adjacent to the Cooper River. This allows for native species to vegetate the treated areas resulting in general habitat iprovement for sturgeon.

Coastal Zone and Marine Resources Mangement (Section 7.13):

- Conducting a Coastal Zone Consistency Review for projects that either disturb greater than one acre or disturb greater than ½ acre and are located within ½ mile of a state coastal receiving water. This ensures pollution and sediment discharge to Cooper River and tributaries is limited.

JB CHS will provide educational information describing shortnose and Atlantic sturgeon and providing information on how to report dead or captured sturgeon at piers, waterways, and other recreational facilities near the Cooper River. JB CHS will distribute educational brochures about sturgeon at natural resource outreach events.

Least Tern

Status. Threatened – State.

Habitat Use and Requirements. Least terns nest on beaches, above the reach of ordinary tides, in open, sandy, graveled or scarified areas. More recently, terns have begun nesting on rooftops with white, crushed rock or pea gravel substrate. They feed in open water, diving to catch small fish and crustatians.

Habitat Conditions. The surrounding tidal waters provide plenty of feeding areas. Natural nesting areas are not available but a number of flat rooftops suitable for nesting are present on the Installation.

Limiting Factors. Lack of nesting habitat due to beach development and increased recreational use

Installation Status. Possible resident, occassional visitor

In 1993, least terns were discovered nesting on the roof of POMFLANT's Container Repair Building (#320). In 1994, an adjacent building (#317) was also colonized. However, neither colony site has been used since 1995.

Management. Monitor all known, and potential, least tern nesting locations on the Installation. Active rooftop nesting areas will be protected, and enhanced by providing as many of the characteristics listed below as possible.

- A Good Drainage System. A slight roof pitch facilitates rapid water runoff. Eggs and chicks quickly become chilled and die when left in contact with water.

- Covered Downspouts. Downspouts should be covered with domed grates, and commercial gutter covers put over gutters, to prevent chicks from falling into downspouts.

- Parapets. To prevent chicks from falling off roofs, parapets a minimum of six inches high, should extend all the way around the roof. Corner parapets should be ten inches high because frightened chicks tend to pile up in corners.

- Preferred Substrate. White crushed rock or a pea gravel substrate provide the best nesting substrate.

- Shade Structures. If sufficient, raised air conditioning units or fans are not present, artificial shade structures should be put on the roof. These structures also provide some refuge from avian predators.

- Limited Access. Routine roof inspections, and repairs, will be carried out between September and April thereby minimizing nesting season maintenance activity. Casual visits to the roof will be prohibited. Hatches and permanent outside ladders will be locked to prevent unauthorized roof visits.

Public Education. Interested and cooperative building managers, and employees, will enhance tern survival. The importance of rooftop colonies to the continued survival of the lest tern in South Carolina must be understood and careful management implemented.

Swallow-Tailed Kite

Status. Endangered - State; status review – Federal.

Habitat Use and Requirements. Swallow-tailed kites are closely associated with forest wetlands and freshwater marshes. They seldom occur far from rivers, streams, and swamps. Kites usually select the taller trees on the edge of a wetland for nesting. Tall loblolly pines, often 75 to 110 feet in height, are a favorite nesting tree in South Carolina. One or more pairs of kites seen together consistently, during the nesting season (April-June), is usually a good indication of nesting. Kites are gregarious and nest near one another. Single birds seen only once in a few days during this time period are usually transients. Kites feed on insects, snakes, frogs, and occasionally nestling birds.

Habitat Conditions. Suitable habitat is present on the Installation.

Limiting Factors. Reasons for kite population declines remain speculative. However, declines may be linked to several factors:

- Habitat Loss. Kites apparently require a large home range with extensive wetlands. Many of these wetland areas have been altered or drained over the years;

- Low Productivity. Kites produce few offspring and suffer nest predation by raccoons, great horned owls, and other large raptors;

- High Vulnerability. Kites are easily approached and historically have suffered high mortality from gunning. Protection by Federal and State laws and the public's increased appreciation of birds of prey has helped with this problem; and

- Gregariousness. Swallow-tailed kites may be a species that requires its own company for survival. A minimum number of kites in an area may be necessary for successful reproduction.

Installation Status. Possible migrant or occasional visitor. There are no sightings of American swallow-tailed kites on the base. There are about 50 nesting pairs in nearby Francis Marion National Forest.

Management. Potential nest sites will be monitored during the course of ongoing work. If found, management will include:

- Regenerating no more than 15 percent of the trees per 10-year period within a one mile (1.6 km) radius of active nest trees; inactive nest sites may be regenerated;

- Initiate no logging within 300 feet (91 m) of known active swallow-tailed kite nests from April through June, or until fledging is completed;

- Identify areas with large pine trees, near water or wetlands, within the one-mile radius of active nests to be retained for future kite habitat; and

- When nests are found in active sales areas, logging will be coordinated with the SCDNR to protect kite sites.

Frosted Flatwoods Salamander

Status. Endangered- State; Threatened – Federal.

Habitat Use and Requirements. Primary habitat is flatwoods dominated by pine and grass. Flatwoods salamanders are generally found beneath logs near cypress ponds, swamps, and pitcher plant bogs. Breeding occurs in November.

Habitat Conditions. Potential habitat occurs on the base pinelands around isolated wetlands and ponds.

Limiting Factors. Destruction or degradation of isolated wetlands in pine forest habitat

Installation Status. Possible resident

Flatland salamanders are unevenly distributed and uncommon in South Carolina. The 1994-95 herptofauna survey of the Installation by SCDNR did not find any flatwoods salamanders

Management. Isolated wetlands in pine forest will be preserved. It would be beneficial to allow prescribed fire to burn through ephemeral ponds (when dry) in pine flatwoods that could harbor this species, since fire will help maintain these type of open, wetland areas.

Canby's Dropwort

Status. Endangered - Federal and State.

Habitat Use and Requirements. This species is typically found in isolated, wetland depressions and always in association with pond cypress.

Habitat Conditions. The numerous wetlands on the Installation provide potential habitat but only four pond cypress stands occur on the property.

Limiting Factors. The most significant threat to the species is the direct loss or alteration of its wetland habitat. Ditching and draining of lowland areas, primarily for agricultural and silvicultural purposes, has altered the groundwater table and changed the vegetative composition in many areas of the mid-Atlantic coastal plain where the species historically occurred. Roadside maintenance or improvements also threatens this plant in some locations. Consumption by larvae of the black swallowtail butterfly occurs but the degree of consumption among populations and the overall impact is unknown. The small population size of Canby's dropwort makes it vulnerable to potentially harmful losses from collecting.

Installation Status. Unlikely resident

Historical range of the plant includes Berkeley County. However, surveys in 1987 and 1993, for threatened and endangered plants on Installation, did not find Canby's dropwort.

Management. Maintain and preserve wetlands.

Pondberry

Status. Endangered - Federal and State

Habitat Use and Requirements. Habitat for this species is characterized by seasonal saturation. However, long periods of flooding during the growing season are rare. Pondberry is found in areas with sandy soils,

along the shady margins of lime sinks, ponds, and other depressions. It is often associated with soils having a high calcium content. Herbaceous vegetation is usually sparse in the vicinity of pondberry.

Habitat Conditions. Numerous forested wetlands, isolated and contiguous are potential habitat for pondberry on the Installation.

Limiting Factors. Draining, filling, excavating or other alterations to wetlands adversely impact potential pondberry habitat.

Installation Status. Unlikely resident.

The 1987 and 1993 surveys of installation wetlands indicated suitable habitat was available, but no specimens were found.

Management. Maintain and preserve wetland habitats

Chaff-Seed

Status. Endangered - Federal and State

Habitat Use and Requirements. The plant is found in a tropical or subtropical grassland containing scattered trees and drought resistant undergrowth or in longleaf pine woodlands.

Habitat Conditions. Potential habitat is present on the Installation.

Limiting Factors. Clear-cutting and other intensive forestry treatments

Installation Status. Unlikely resident.

The 1987 and 1993 surveys found potential habitat, but no specimens were found.

Management. Management practices that encourage this species include prescribed burning on a two or three year interval and prohibition of intensive site preparation methods. If specimens are found a buffer zone will be placed around each colony. Timber harvesting will be excluded from this buffer zone unless deemed advantageous to this sensitive species.

Rafinesque's Big-Eared Bat

Status. Endangered – State.

Habitat Use and Requirements. Inhabits forested regions of pine flatwoods and hard wood hammocks. They will roost in hollow trees, crevices behind bark, under dry leaves, and buildings and other man-made structures, sometimes in rather lighted areas. Colony size could range from two to 100 individuals.

Habitat Conditions. Although no species were captured during 2001 survey potential habitat occurs in hardwoods sites with large trees.

Limiting Factors. The greatest threat is habitat loss, especially forested wetlands. Large, older trees that have cavities for roosting are now rare in the landscape. A recent study revealed that bats move between several tree cavities during the summer indicating that a small colony needs lots of space. Forested

corridors connecting to other forested wetlands are important because these bats generally avoid open spaces. Fragmentation of our forests may reduce their ability to move between different forested areas.

Installation Status. Confirmed resident. No individuals were captured during 2001 survey but this species was "confirmed" at both Weapons Station and NAAF in 2018 survey.

Management. Identify and protect habitat for bats, especially colony sites (both maternity and winter sites). Mature bottomland hardwood forests should be protected and forested corridors, preferably along water, need to be maintained as well. Bats should be discouraged from using buildings occupied by humans. Erect bat boxes in suitable habitat where cavity trees are limited.

Southeastern Myotis

Status. Threatened – State

Habitat Use and Requirements. This species requires a variety of roost sites across its range typically roosting in clusters of several to a few hundred or more individuals. It is generally associated with bottomland habitats with large, hollow trees, often near water. These bats forage primarily over lakes, ponds and slow-moving streams, flying close to the water's surface.

Habitat Conditions. Hardwood sites with large hollow trees provide natural roosting habitat.

Limiting Factors. Colonies are extremely sensitive to disturbances and are easily driven away from roost by humans. The major threat to this bat is destruction of roost by humans.

Installation Status. Confirmed resident. One individual captured during 2001 survey. No individiuals of this species found during 2018 survey.

Management. Protect mature bottomland hardwood forests and riparian areas. Preserve large hollow trees suitable for roosting. Erect bat boxes in suitable habitat where cavity trees are limited.

7.5 Water Resource Protection

Program Overview/Current Management Practices

Storm water 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. Storm water runoff management addresses measures to reduce flow energy and pollutants in storm water, and to control discharge from point and non-point sources. Non-point source pollution is pollution of surface-water and groundwater resources by diffuse sources. Point source pollution is pollution identified by a single, identifiable point source.

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

Storm water and water quality program is primarily the responsibility of base environmental staff supported by Natural Resource staff. The program will be guided by the following management concepts for storm water runoff and water quality control:

- Continue to manage storm water in natural areas consistent with BMP's described in the SWPPPs, to the extent practicable. The purpose of the SWPPPs is to describe efforts proposed by JB CHS as

part of their storm water management program. The SWPPPs goals are to identify pollutant sources potentially affecting the quality and quantity of storm water discharges, and provide BMPs for construction activities (see Tables 7-3 for MS4 BMPs applied to JB CHS Weapons, and Table 7-4 for MS4 BMPs applied to JB CHS Air).

- Update SWPPPs to include storm water management practices for non-industrial areas such as forested and shoreline areas, and for non-industrial activities such as forest clearing and reforestation, and timber stand improvement.

- Protective buffer strips or corridors of designated widths will be maintained and/or developed around wetlands and along shorelines. Allowances will be made for essential military mission requirements;

- As part of the Oil and Hazardous Substance Spill Contingency Plan, implement the natural resource damage assessment program for assessing natural resource damages arising from the release of oil or hazardous substances that injure or threaten to injure natural resources of the United States. The program consists of criteria and procedures for collecting and evaluating the extent of damage to natural resources resulting from an incident and for determining restoration measures.

- Manage storm water runoff from new development in order to protect adjacent natural areas.

- Assess alternatives to current pesticides, herbicides and fertilizers with to protect water quality.

- Consult with the NOAA-NMFS for any projects that have the potential to adversely affect EFH.

- Ensure that all JB CHS construction activities in the Cooper River comply with the 23 March 2006 NOAA-NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* which are applicable to Atlantic sturgeon. These conditions include making personnel aware of the protected status and potential presence of the species, measures to avoid entangling or otherwise harming the species, and notification requirements in the event an Atlantic sturgeon is injured as a result of construction work.

Table 7-3. JB CHS Weapons MS4 Storm water Management Plan BMPs

BMP	Description	Measurable Goal
New Staff Awareness Training	All staff arriving on JB CHS-Weapons will be trained on Phase II Program goals	All new staff receives training within three months of arrival
New Resident Awareness Training	Provide materials describing Phase II goals in new resident packets and housing manuals	All new residents receive materials
Intranet Site Storm Water Page	Add link to an intranet site page dedicated to storm water education	Publish storm water page on JB CHS-Weapons web site
Slides on JB CHS-W Housing Broadcasts	Prepare a slide presentation to run on Housing Television	Slides on Housing TV

Articles in JB CHS Newspaper	Prepare articles for publication on a quarterly basis	Publish four articles per year
Presentation at JB CHS-Weapons Schools	Coordinate with schools to make presentation at educate school-children of storm water policy	Prepare presentations for schools
Environmental Quality Subcommittee Meeting	Meetings attended by environmental stakeholders on JB CHS-Weapons	Storm water will be a permanent agenda item/topic at meetings
Storm Drain Stenciling	Storm drain stenciling involving residents and sailors	Stencil 1638 drain inlets
Household Waste Awareness	JB CHS-Weapons develops training awareness for household items	Program developed and distributed
Public Involvement Hotline	JB CHS-Weapons will establish a Hotline for residents and employees to report any malfunction or damage to storm water structures as well as illegal dumping and suspicious discharges	Establish Hotline with advertisement through all public education opportunities listed above
Adopt-a-Highway Program	Promote campaign to encourage volunteers to keep a section of roadway free of litter	Designate roadways to be adopted and match organizations capable of participating
Illicit Discharge/Dumping Hotline	JB CHS-Weapons will establish a Hotline for residents and employees to report illegal dumping and suspicious discharges	Establish a Hotline with advertisement in JB CHS newspaper and command channels
Storm System Mapping	Continually update system as construction activities continue	Storm systems maps will be updated annually
Identify Illicit Discharge through Dry-Weather Screening	Facility age and previous construction techniques may have resulted in directly connected and/or leaking sanitary waste lines	A survey during dry-weather of 25 percent of the storm drain system outfalls per year will be conducted to identify non-storm water flows
Policy Prohibiting Non-Storm Water Discharges	JB CHS emphasis will be placed on establishing policies	Local policy will emphasize non-storm water discharges
Evaluate Waste Recycling Program	JB CHS waste policies and procedures will be reviewed and updated to provide consistency among organizations; residential policies will be created	Household hazardous waste program in place

Illegal Dumping Control (Signage)	Illegal dumping is the disposal of waste in an unpermitted area, such as a back area of a yard, along a stream bank, or at some other off-road area; pouring liquid wastes or disposing of trash down storm drains can also qualify as illegal dumping	Post signage in all prone public areas prohibiting illegal dumping; include Hotline number on signage as a means to report violators
Erosion Control Inspector Training	The purpose of the Certified Erosion Prevention and Sediment Control Inspector Program (CEPSI) is to educate field personnel on the proper installation, maintenance and inspection of erosion prevention and sediment control measures at construction sites	All staff and contractors that conduct on-site inspections have completed formal training; SCDHEC currently endorses CEPSI program administered by Clemson University
Storm Water Plan Reviewer Training	The purpose of the Certified Storm Water Plan Reviewer (CSPR) program is to educate personnel on the proper design and review of storm water and sediment control plans for development sites in order to meet regulatory and environmental requirements	All staff that conduct plan reviews are formally trained; SCDHEC currently endorses the CSPR program administered by Clemson University
Construction Site Inspections	Develop a formalized inspection protocol to ensure proper implementation of storm water controls	Program and controls developed utilizing an informal tracking method
Develop Policy for Tracking Complaints	JB CHS-Weapons will establish a Hotline for residents and employees to report storm water issues related to construction sites; protocols will be established for reporting violations through the Contracting Officer	Policy complete
JB CHS-Weapons Storm Water Policy Review	Review and as necessary amend JB CHS policies to ensure enforceable requirements for erosion and sediment controls	Policy complete
Develop Post-Construction Storm Water Policy	Integrated post-construction program to control flow and water quality from new construction projects	Policy developed and implemented

Develop Technical Criteria for Selected Control Strategies Including Non-Structural BMPs	Review and define acceptable BMPs for use on JB CHS-Weapons	Design guide developed and adopted
Training	Staff will be trained on requirements of Post-Construction Policy	Annual training conducted
Ensure All BMPs are Implemented and Maintained	Develop controls to ensure BMPs are maintained long-term	Develop inspection schedule and criteria
Reduce Impervious Surfaces	Develop strategies to reduce impervious surfaces in future development	Develop policies to promote utilization of alternative methods
Storm Drain and Outfall Inspections	Modify or establish policy to include inspection of storm drains, culverts and other conveyance mechanisms annually	100 percent of delineated outfalls and 90 percent of storm drains are inspected annually
Prioritize Targets for Site-Specific BMPs	Prioritize the areas to be targeted for site-specific BMPs	Develop list of site-specific BMPs
Develop Site-Specific BMPs	Site-specific BMPs will be incorporated in the Standard Operating Procedures of targeted stakeholders	BMPs are developed within two years
Develop Storm Water Inspection Checklist	JB CHS-Weapons will develop a list of storm water structures in the storm water system	Checklist developed
Routine Inspections of Storm Water System	JB CHS-Weapons will develop a program to inspect all structures in the storm water system	Inspect 25 percent of storm water structures per quarter
Routine Maintenance of Storm Water System	JB CHS-Weapons will perform routine maintenance on storm water structures	Perform routine maintenance on 25 percent of storm water structures per quarter

Table 7-4. JB CHS Air MS4 Storm water Management Plan BMPs

Minimum Control Measure	Action/Activity	Initial Implementation Date	Reporting Measures	Supporting Documentation	Comments
New Staff Training	Information on Base Public Website https://etest.amc.af.mil/.	3/01/2011	Number of times webpage is accessed	Verification of webpage created for storm water educational materials	JB CHS - Air webpage.
New Resident Training	New resident packet brochure	3/01/2011	Number of new residents	Copy of brochures	Each new resident receives a packet upon arrival from the Housing contractor.
Electronic Billboard	Base marquis scrolling message	3/01/2011	Number of times message appears per day	Copy of message and date shown	Three sentences can run for three days.
Base Newspaper	Article in "Patriot Dispatch"	3/01/2011	Number of newspapers distributed	Copy of article and date published	A storm water article will be included frequently.
Storm Drain Placards	Storm drain placards	3/01/2011	Maintenance of Existing Placards	Copy of storm drain placard Photographs of event	Annual assessment of placard condition.
24-hour phone lines	24-hour Response Number for Spills* 911 Fire Department	3/01/2011	24-hour number 911 Fire Department	Number of calls/reported spills per year	Phone number(s) to be distributed to residents, posted on website, and included in materials distributed.
Earth Day Activities	Earth Day Poster Contest or Earth Day Information Booth at local schools	3/01/2011	Number of school children participants/entries and date of event	Photographs of event	Local Schools will be solicited for participation.
Volunteer Monitor and Clean up Group	Volunteer monitor and cleanup group	3/01/2011	Number of volunteers, violations observed, and amount of debris removed.	Photographs of event	Volunteers will be solicited through public notices and Stakeholder Meeting.

Minimum Control Measure	Action/Activity	Initial Implementation Date	Reporting Measures	Supporting Documentation	Comments
Stakeholders Meeting	Meeting to solicit volunteers	3/01/2011	Number and type of meeting notices distributed to residents and number of volunteers/meeting attendees	Copy of notices and meeting minutes	"Housing Happenings", "Airlift Dispatch", Cable Channel 2, Base website, and Base marquis can be used for public notices.
Storm Drain Placards	Storm drain placards	3/01/2011	Maintenance of Existing Placards	Storm drain placards	Annual assessment of placard condition.
Prohibit Discharges	CAFB Pamphlet 32-301 by order of the Base Commander includes prohibition of illicit discharges and enforcement actions	3/01/2011	No reporting required	Copy of CAFB Pamphlet 32-301	Memorandum and notices are distributed to residents.
Storm Sewer System Map	Storm sewer map	3/01/2011	Verify map developed and updated annually as necessary	Copy of map	JB CHS - Air Storm water Drainage Area Map Figure 1.3
Dry Weather Inspections	Implement Plan to detect and address illicit discharges	3/01/2011	Report as needed	Annual Comprehensive Storm water Inspection	Performed throughout the year
	Volunteer group for locating and visually inspecting outfalls	3/01/2011	Number of volunteers and outfalls inspected	Photographs of event and document findings	Volunteers will be solicited through public notices.
Educational Flyers	Publicize and facilitate public reporting of illicit discharges	3/01/2011	Number of calls/reported spills per year	Verification that 24-hour number established and publicized	Include number in newsletters, on website, and educational materials distributed.

Minimum Control Measure	Action/Activity	Initial Implementation Date	Reporting Measures	Supporting Documentation	Comments
Guide Specifications	Requirement from Base Commander for construction managers to comply with program requirements	3/01/2011	No reporting required	Joint Base Charleston Environ-mental Specifications (Section 01501-Page 6, Para 1.11).	Specifications set policy for review, inspection, and enforcement.
Site Plan Reviews	Construction site plan/NOI review by CEIE	3/01/2011	Number of plans/NOIs reviewed by 628 CES/CEIEQ	Correspond-ence	Site plan review process will include land disturbing activities equal to or greater than 1 acre and greater than ½ mile from receiving water body of the State
Site Inspections	Inspections and Penalties	3/01/2011	Number of inspections and penalties for each construction site	Copy of inspection checklists	Inspections occur by CE Construction and contractors; CE Construction will provide new checklists and training for SWMP program.
Construction Site Waste Management Plans	Contractors submit a construction site waste management plan during contract execution. Plans verified by Base MS4 representative.	3/01/2011	Number of plans/NOIs reviewed by 628 CES/CEIEQ	Records of onsite evaluations; Reports completed and filed.	
Base Design Policy	Develop base instruction setting forth design policy for point source discharges at new facilities.	3/01/2011	No reporting required	Copy of design policy	Instruction to be written and signed by appropriate military authority.

Minimum Control Measure	Action/Activity	Initial Implementation Date	Reporting Measures	Supporting Documentation	Comments
	Memorandum from Base Commander to construction managers regarding program requirements (including post-construction planning requirements)	3/01/2011	No reporting required	Copy of memorandum	Memorandum to set policy for review, inspection, and enforcement.
Project Reviews	Construction site plan review by 628 CES/CEIEQ to include post-construction BMPs	3/01/2011	Number of plans reviewed by 628 CES/CEIEQ	Correspondence	Site plan review process will include land disturbing activities equal or greater than 1 acre and less than 5 acres.
Post-Construction Database	Develop a database to track BMP maintenance requirements for all completed construction projects.	9/1/2012	No reporting required	Database developed and information on existing completed facilities with storm water BMPs entered.	
Annual Inspections	Annual inspection of each completed project with permanent BMP maintenance requirements.	3/01/2011	Number of sites inspected	Document findings	CE Construction conducts inspections.
Employee /Contractor Training	Staff and contractors associated with potential storm water pollutant sources are trained using the eTEST computer based training website.	3/01/2011	Verify training includes representatives from Joppa, CE Construction, and Housing.	Training records, schedules, and materials used	Current training program with annual refreshers are required for representatives from Joppa, CE Construction, and Housing.
High Risk Area Inspections	Develop list of high-risk areas. Inspect high-risk areas on a quarterly basis.	3/01/2011		Document findings	

Minimum Control Measure	Action/Activity	Initial Implementation Date	Reporting Measures	Supporting Documentation	Comments
Street Sweeping	Waste disposal and street sweeping program	3/01/2011	Report activities in accordance with Programs described below.	See Program below	See Program below
Housing MS4 Instruction	Discourage vehicle maintenance in residential area	3/01/2011	No reporting required	Document rule	Letter discouraging vehicle maintenance in residential area currently in place.
Housing MS4 Instruction	Encourage approval of off-Base chemicals used for lawns in residential area	3/01/2011	No reporting required	Document rule	Approval currently requested for off-Base lawn chemicals in residential area currently in-place.

7.6 Wetland Protection

Program Overview/Current Management Practices

Wetlands management is an essential component of ecosystem management because proper management will preserve, enhance, and create habitat for a variety of wildlife species, while providing aesthetic and educational values. Changes to hydrology, geochemistry, substrate, or species composition may impair the ability of a wetland to function properly. Such alterations can affect the ability of the wetland to filter excess sedimentation and nutrients from surface water resulting in deteriorated surface water quality.

In accordance with USAF policy JB CHS will continue to avoid actions which would either destroy or adversely modify wetlands to the maximum extent practicable. Protective buffer strips or corridors of designated widths will be maintained and/or developed where feasible around wetlands and along streams. Vegetative buffers between wetland and upland vegetative communities will help maintain and improve water quality by filtering sediments and other pollutants from runoff prior to discharge into the wetland. Vegetative buffers will also provide habitat for a diversity of wetland and upland species. Width of the buffers will be determined by BMPs; edaphic characteristics (i.e., topography and erodibility); sensitivity and uniqueness of wetland fauna and flora; and degree of disturbance. As a general guideline, a minimum 50-foot buffer will be left undisturbed adjacent to permanent streams, natural forested wetlands, and ephemeral wetlands. Where possible, the buffer will be extended to 150 feet. Restrictions within these buffers include activities such as heavy equipment operation (which can alter wetland hydrology by compacting soils and/or creating ruts), application of pesticides with acute toxicity to fauna, soil horizon disturbance, and intensive timber harvest. Other potential long-term management concepts for wetlands may include the creation and expansion of wetlands, wetland quality monitoring, and more extensive inventory of existing wetlands.Vehicular stream crossings and using stream bottoms as trails will be limited so as to prevent stream damage and disruption of aquatic systems.

Wetland systems within the Installation provide valuable wildlife habitat, water quality protection and flood protection. However, because of various site constraints and the need for future development of lands, JB CHS will be required to balance the need to protect wetland resources with supporting the military mission.

Proper management of wetlands is necessary to enjoy the benefits provided by wetlands and to comply with federal laws and regulations.

7.7 Grounds Maintenance

Program Overview/Current Management Practices

Grounds maintenance is provided by contract and is managed by 628 CES Operations Support. The ground maintenance contract outlines maintenance level requirements that the contractor is to provide for grounds maintenance services. Grounds maintenance services include mowing (including improved, semi-improved, and unimproved grounds); edging; pruning; mulching; planting, fertilization; trash and litter collection and disposal; ditch cleaning; fence line maintenance; raking; tree and stump removal; erosion control; irrigation; grassing; sodding; and other miscellaneous services.

The NR manager coordinates with 628 CES Operations Support to ensure that required buffers are maintained, exotic invasive plants are not planted, and sensitive habitats are not disturbed.

JB CHS is an annual recipient of the Tree City USA award. The Tree City USA program is sponsored by the Arbor Day Foundation in cooperation with the United States Department of Agriculture Forest Service and the Association of State Foresters. The award is presented to recognize excellence in urban forestry. In order to be recognized as a Tree city USA, communities must meet four standards: they must have a tree board or committee, must have a tree care ordinance, must have a comprehensive community forestry program and must have an Arbor Day observance.

The JB CHS Tree Ordinance (Section 14.2) addresses issues including the identification and protection of Heritage Trees, recommended and prohibited trees for on-Base planting, as well as standards and requirements regarding tree quality, placement, maintenance, protection, and removal. JB CHS has committed a minimum of $2 per capita to urban tree management, including planning, education, tree establishment, maintenance, protection, and removal and any and all other tree care or management.

7.8 Forest Management

Program Overview/Current Management Practices

AFI 32-7064, 17 September 2004 states, “The principal objective of forest management on Air Force installations is to maintain and enhance ecological integrity of forested landscapes while supporting the military mission.” Under the principles of ecosystem management, forest treatments, to include commercial harvesting of forest products, may be used to achieve installation goals for: forest enhancement and restoration, wildlife habitat improvement, wildfire protection, recreational activity, military training requirements, airfield and ordnance safety compliance and wood protection. JB CHS has two forest management areas, one at JB CHS Air’s NAAF and the other at JB CHS Weapons. Management plans are similar for the two locations, although there are some differences due to past management practices.

7.8.1 Forest Management Practices on Air Force Lands

<u>Commercial Activities</u>

- Commercial harvesting of forest products on JB CHS lands is authorized provided that such use is compatible with the military mission and consistent with the goals stated in this INRMP. These goals include: management of federally listed threatened and endangered species, biodiversity conservation, watershed protection, wildlife habitat enhancement, outdoor recreation, and scenic quality. Per DoD policy forest products will not be harvested for short-term profit at the expense of long-term sustainability of other ecosystem functions on JB CHS.

Timber Harvesting Methods

- Appropriate cultural practices will be used to maintain the forest ecosystem in a healthy condition and achieve the goals stated in this INRMP. Acceptable timber harvest practices and management schemes are discussed below in Section 7.8.6.

Best Management Practices

- South Carolina Forestry Commission (SCFC) BMPs will be implemented in forest management operations to minimize environmental impacts. JB CHS poliecy autments the SCFC's BMPs by requiring Streamside ManagementZones (SMZs) extent to 100 feet from stream-center on each side of the waterway.

Reforestation

- Reforestation activities will be conducted on JB CHS as detailed in Section 7.8.6. In general, pro-active regeneration methods will be favored to renew timber stands on soils suitable for the species bed regenerated. By utilizing heavy site preparation techniques the future growth and survival of the planted seedlings will be ensured as opposed to natural regeneration with little to no site preparation. Both mechanical and chemical treatments will be utilized in conjunction with prescribed fire for site preparation. All regeneration sites will be inspected after the first, third, and fifth growing seasons to evaluate seedling survival.

Forest Road Construction and Maintenance

- NR staff will conduct annual evaluations of the existing network of forest access roads and trails. Forest road construction and management will be consistent with the ecosystem management objectives. Design and maintenance of forest access roads will be in accordance with applicable state BMPs. Construction of new single-purpose forest access roads will occur only when absolutely necessary. Temporary roads and trails constructed for timber harvesting operations will be closed to vehicular traffic after sale completion unless the road is identified in the INRMP as necessary to support military mission or other natural resources goals.

Forest Inventory

- A forest inventory will be maintained and updated at least once every 10 years. A geographic information system (GIS) will be used to record and access forest inventory data.

7.8.2 Forest Protection

Protection from Insects and Disease

- To the extent practicable JB CHS will support U.S. Forest Service (USFS) and SCDNR programs for the detection, control and eradication of epidemic forest insects and disease. AFI 32-1053, *Integrated Pest Management*, provides guidance on the use of pesticides for forest health protection. Public Law 95-313, Cooperative Forestry Assistance Act of 1978 and Title 16 USC, Section 2104, provide for USDA assistance for forest health problems on all federal lands. Personnel will contact the appropriate USFS or SCFS office to obtain a biological assessment for any forest health issues on the installation. If a biological assessment indicates that funds are needed for forest insect and disease control, a funding request, along with a copy of the biological opinion, may be submitted to The Air Force Civil Engineer Center, Environmental Center of Excellence, Technical Support (AFCEC/CZ). AFCEC/CZ will consolidate Air Force funding requests and forward them to the Armed Forces Pest Management Board for consideration and potential referral to the USFS.

Forest Fire Protection

- Refer to Section 7.9 for guidance on wildfire protection and Section 15.0 for the installation's comprehensive Wildland Fire Management Plan.

7.8.3 Forest Product Sale Procedures

Per DoD requirements JB CHS will not give away, abandon or destroy forest products with marketable value. Payment will be collected for all forest products with economic value harvested on JB CHS. Forest products may not be traded for goods or services nor used to offset contract costs associated with construction, land clearing, or other contracted activity. An attempt will be made to offer for sale any forest products that require removal prior to initiation of construction or other land clearing operation. Prior to any land clearing or construction activity, JB CHS personnel will contact at least three buyers of forest products within the region to determine if they are willing to make an offer on the forest products requiring disposal. These restrictions do not apply to materials determined to have no commercial value, as determined by a professional forester.

Small Lot Sales

- Forest products with an appraised value at $25,000 or less may be sold by means of an installation small-lot sales contract. These sales will be conducted only when they serve the best interest of the government. Larger timber disposal sales will not be split into small lots to avoid formal bids. JB CHS may use a small-lot sales contract to remove timber appraised at greater than $25,000 when immediate tree removals are necessary to meet airfield safety requirements as defined by an impending downgrade of airfield operability status. Informal bids must be solicited from at least three potential buyers. Documentation will be made of all contacts and bids received, including contacts that respond with no bid. The AFCEC/CZ forester may also conduct small-lot sales on behalf of the Base.

Large Sales

- Forest products with an appraised value of greater than $25,000 will be disposed of by contract sale utilizing competitive bidding procedures and the following guidelines.

Sale Preparation

- For all large forest product sales a contract will be prepared with specifications that describe in detail the forest products, sale areas, allowable harvest methods and restricted activities. The contract will include maps or drawings of the gross sale area and net removal area. A professional forester must perform or supervise the layout of sale area boundaries and the marking of trees within a timber sale area.

Sale Appraisal

- Appraisals of the fair market value of forest products offered for sale on JB CHS will be obtained prior to disposal. A written justification will be prepared if forest products are sold for less than their appraised value. Regionally accepted standards for scaling, measuring or weighing forest products will be used. Appraisal documents for identified sales will be marked with "FOR OFFICIAL USE ONLY," and appraisal documents will be released only on a need-to-know basis.

Sale Marketing

- Each JB CHS forest product sale contract will have a solicitation for bid describing the forest products offered for sale and required harvesting specifications. Bids will be solicited either by

means of lump-sum value or by scaled value per unit volume for each product class. Forest products for sale will be advertised to buyers within the region specified by the servicing contracting office.

Sale Contract Term

- Forest products will be removed within 1 year or less from the date of the contract award unless a longer term is deemed to be in the best interest of the government. For sales extending longer than 3 years a rate predetermination clause will be included to reflect changes in market value.

Sale Inspection

- The contract officer or designee will regularly inspect ongoing forest harvesting activities. The forest products buyer will be responsible for executing all the terms and conditions of the contract. Any discrepancies will be documented and reported to the contracting office. The contracting supervisor will make a determination on contract completion based upon a final inspection and report indicating that all contractual obligations have been met.

Sale Revenue Collection

- Revenues collected from forest product sales will be recorded on a DoD Form 1131, Cash Collection Voucher. Proceeds from the forest product sales will be deposited in Deposit Fund Account 57 3 3400 303 31FF 04 59900 EM4M4P 667100 91256F. If sales are made on a unit weight basis weight tickets from certified government or commercial scales will be used as a basis for collection. Sales contracts may provide for scheduled payments by the buyer. Refundable security deposits received from a buyer will not be deposited with forest product sale collections. Instead, security deposit payments will be held in a temporary suspense account until funds are either disbursed back to the buyer or converted to revenue collection.

Protection of Sensitive Resources

- Contracts for harvesting forest products on JB CHS will specify safeguards for protection of sensitive natural and cultural resources and will include clauses that identify penalties for damages incurred. Clauses that identify penalties for removal or damage or forest products not designated for disposal will also be included.

7.8.4 Procuring Forest Management Services

Federal Assistance

- The USFS is the lead agency responsible for federal forest management in the United States. Under the authority of the Sikes Act, and as restricted by the Economy Act (title 21, USC, Section 1535), JB CHS may enter into Interagency Agreements that provide for the transfer of funds to the USFS for assistance in the form of personnel, agency services, or assistance with contracting actions that implement forest management practices. JB CHS may also access the services of the USFS by means of an agreement between HQ AFCEC and the USFS for Air Force-wide forest management support. USACE, under the authority of the Economy Act, may be used as a contracting agent for disposal of forest products from JB CHS.

State Assistance

- Under the authority of the Sikes Act (16 USC 670a-f) JB CHS may request AFCEC enter into cooperative agreements on its behalf with the state to execute its forest management programs. Such agreements will provide a means by which the state will be reimbursed for obligations incurred in support of the forest management practices authorized by that agreement.

Service Contracts

- Service contracts for forest management support may be used when in-house resources are not available. A professional forester must review all service contracts that implement forest management practices.

7.8.5 Financial Management

- 10.U.S.C. 2665 authorizes refunding forest management obligations with proceeds derived from the sale of forest products. DoD Financial Management Regulation Volume 11A, Chapter 16, Accounting for Production and Sale of Forest Products, paragraph 160203 lists the appropriate expenditures that can be reimbursed from forestry program funds.

7.8.6 Forest Management on JB CHS

JB CHS consists of JB CHS Air and JB CHS Weapons and comprises approximately 10,020 acres of managed forest land. JB CHS will protect and enhance forest resources by practicing ecologically-sound forest management practices leading to production of quality forest products, watershed protection, outdoor recreation opportunities, and wildlife habitat protection and management. Forest management actions generally include reforestation, timber stand improvement, prescribed burning, timber sales and other directly related functions. Forests will be managed using a rotation age of 80 years for loblolly pine and hardwoods with a longleaf pine rotation of 120 years. Within these rotations and other forest management activities a sustained yield of quality forest products will be produced. The program is set up using a Ten-Year Management Plan with continual review and updating allowing the flexibility to take advantage of changing timber product markets.

In addition, JB CHS's Forest Management program provides direct mission support by providing expertise and information to mission planners on methods and impact of various types of forest management activities. JB CHS's Forest Management program also contracts merchantable timber to be harvested from areas that interfere with military mission line-of-sight, ordnance storage, or other capabilities and can manipulate forest structure in a specific area for a mission test or training needs. Another Forest Management responsibility is to plant trees to create a security buffer, visual screen, or to reduce noise impacts.

7.8.6.1 Forest Management on JB CHS Air

JB CHS Air consists of the JB CHS Air Base and NAAF, and contains approximately 1,149acres of managed forest land.

For all practical purposes the JB CHS Air Base has no managed forest land, so no forest management plan is incorporated into this INRMP. The forest land that is present mostly consists of small acreages unsuitable for management. However, these and other forested areas provide visual buffers and/or sound dampening around military activities such as explosive ordnance disposal areas, campgrounds, recreational vehicle parks. They also provide wildlife habitat and/or serve to enhance Base aesthetics.

7.8.6.2 North Auxiliary Airfield Current Forest Management and Initiatives

Approximately 1,149 acres of forest are managed at NAAF. Forest management goals at NAAF are to maintain and enhance ecological integrity of the woodlands while supporting the military mission. Under the principles of ecosystem management, forest treatments (to include commercial harvesting of forest products) may be used to achieve installation goals for: forest enhancement and restoration, wildlife habitat improvement, wildfire protection, recreational activity, military training requirements, airfield safety compliance and wood protection.

The topography and soils at NAAF provide suitable conditions for various species to grow and thrive in the well-drained soils surrounding the airfield and the slopes leading down to the wetlands of the Edisto River floodplain. Other than the extensive pine-hardwood stands adjacent to the river most of the forest consists of small, even-aged, blocks of pine or pine-hardwood of various age classes. This represents a good forest stand structure: an overall uneven-aged forest but with a mosaic of even-aged stands that can be thinned, or clear-cut. Reforestation efforts will consist of planting longleaf pine in uplands with suitable soils and loblolly in other areas. Mesic hardwood areas will be managed to maintain hardwoods through natural succession techniques. NAAF serves to complement JB CHS's overall timber harvesting efforts by offering additional harvesting alternatives to take advantage of local timber markets while operating in an ecologically sensitive manner. Although both mechanical and chemical site preparation treatments may be used prior to tree planting, chemical treatment will be the preferred method to protect the fragile upland soils. The small parcel size coupled with chemical application will also help to control soil erosion. Prescribed burning will be scheduled on a 3-year cycle.

NAAF has a good road system with some improvements needed for improved access to areas in the Edisto River floodplain.

North Auxiliary Airfield Forest Types

Figure 7-1 shows NAAF forest types. Table 7-1 provides timber type with respective acreages.

Table 7-5. Timber types and acreages at North Auxiliary Airfield

Timber Type	Number of Acres
Loblolly Pine	463 Acres
Loblolly Pine-Mixed Hardwood	147 Acres
Longleaf Pine	33 Acres
Loblolly Pine-Longleaf Pine	22 Acres
Mixed Hardwood	484 Acres
Total	1,149 Acres

Figure 7-1. Forest types – North Auxiliary Airfield

7.8.6.3 Weapons Station Current Forest Management and Initiatives

Approximately 8,915 acres of woodlands are included in the forest management program at JB CHS Weapons. Forest management goals at JB CHS Weapons are similar to those at NAAF. The program uses a Ten-Year Management Plan with continual review and updating (See Forest Management Plan in Section 15.0).

In 1989 Hurricane Hugo severely damaged nearly 7,000 acres of timber on JB CHS Weapons. Much of this timber was salvage cut and most cut-over areas naturally regenerated. The resulting timber stands were predominantly 24-year old loblolly pines as of 2013. Due to that catastrophic hurricane event current forest stand conditions reflect an imbalance in both age class distribution and species composition. Pre-Hugo, JB CHS Weapons had a significant mature longleaf pine component that is now largely absent. The longleaf stands did not naturally regenerate back to longleaf pine but rather to the invasive and faster growing loblolly pine. In an effort to re-establish longleaf pine over 1,000 acres of longleaf pine have been planted since 1993. With the invasion of loblolly pine seed from adjacent loblolly stands and lack of mid-rotational control treatments, nearly 700 acres of these previously planted longleaf stands have been converted to the loblolly-longleaf timber type. Remarkably, much of the 500-600 acres of young loblolly pine in Marrington Plantation survived the hurricane force winds. Many of these trees now are in the 50-60 year old range.

Currently 59 percent of the managed forestland is classified as loblolly pine forest cover type. If the pine-hardwood forest type (mostly loblolly) is combined with the loblolly forest type, the percentage increases to 88, further emphasizing the present pine species imbalance. Total pure hardwood acreage is smaller than desired and is scattered across the landscape or located adjacent to bottomlands. Though limited in total area, hardwoods nevertheless contribute a disproportionately large amount to the food and habitat needs of JB CHS Weapons' wildlife. Major hardwood species on JB CHS Weapons include oak, hickory, dogwood, sweetgum, holly, maple, poplar, and blackgum.

As is the case at NAAF, forest treatments at JB CHS Weapons (to include commercial harvesting of forest products) may be used to achieve installation goals for: forest enhancement and restoration, wildlife habitat improvement, wildfire protection, recreational activity, military training requirements, airfield safety compliance and wood protection.

For the future, an aggressive timber harvesting program that started in 2008 will continue. Due to the impacts of Hurricane Hugo, virtually all the loblolly pine stands at JB CHS Weapons are becoming merchantable at the same time. The existing naturally regenerated pine timber stands are too thick and intense competition has resulted in reduced growth rates and a high mortality rate. This crowded condition makes the trees more susceptible to disease, insect infestation, and perhaps most importantly highly vulnerable to potential wildfires due to heavy fuel buildup. Wildlife foods are also less plentiful and suitable due to the lack of sunlight penetrating the pine tree canopy needed to foster development of herbaceous plant growth.

Loblolly/Mixed Hardwood Management Strategy at JB CHS Weapons and NAAF

The rotation age for loblolly pine is typically 80 years. In order to reach that goal harvests will consist primarily of selective thinnings in post-Hugo naturally regenerated loblolly stands. These thinnings will improve forest health while assisting in forest fuel management and improvement of wildlife habitat. Units should be considered for thinning when the dominate/co-dominate basal area is 100 square feet per acre or higher. Initial thinnings of intermediate stands (4-10 inch diameter at breast height [dbh]) will strive to leave a residual basal area of 70-90 square feet. All initial thinnings will be conducted by the "herringbone method" in order to reduce damage to residual stems. Secondary thinnings of stands

entering or in the saw timber merchantability class (>10 inches dbh) will strive to leave a residual basal area of 40-60 square feet per acre. All longleaf pine will be a priority to remain after the thinning as opposed to loblolly pine.

Hardwoods will also be thinned from loblolly stands during harvests. However, dominate and co-dominate white oaks, red oaks, hickory, and blackgum will be a priority to remain in the stand to improve habitat for wildlife species which prefer hard mast. Sweetgum and red maple will be a priority to remove during thinnings.

Hardwood Management Strategy at JB CHS Weapons and NAAF

Areas at JB CHS Weapons and NAAF which are predominately hardwood forests are mesic sites which include gum ponds, cypress ponds, drainages, flowing stream bottoms, marsh edges, areas adjacent to wetlands, and floodplains adjacent to the Edisto river. The majority of the year these areas are not suitable for mechanical harvest due to wet, soft, soils. Additionally, these areas provide critical habitat for wetland species of wildlife, provide natural flood control, provide natural fire breaks, and add diversity to the pine domimated landscape.

Management of these hardwood areas will be through a natural successional management scheme. Intensive harvesting techniques will not occur in these areas. Every effort will be made to identify these areas for protection while adjacent units are being harvested or thinned. Identifying mesic sites will protect against soil damage by mechanical equipment. These mesic sites should be allowed to burn in a mosaic pattern during prescribed burn operations to maintain a mature over-story of hardwoods except when natural disturbance creates pockets of early successional habitat.

Longleaf Pine Initiative for JB CHS Weapons and NAAF

Clear-cut harvests will focus on units with soils suitable for longleaf pine to thrive. Soil reports for JB CHS are located within the appendixes. Soil surveys are available for the entire base area with multiple soils suitable for growing longleaf pine but seven of these soils are considered excellent. These soils have a site index value for longleaf pine of 80 feet or higher and also produce a minimum of 100 cu.ft./acre/ year. These soils are: Ct- Chipley, CvA- Craven Loam 0-2% slopes, CvB- Craven Loam 2-6% slopes, DuA- Duplin fine sandy loam 0-2% slopes, DuB- Duplin fine sandy loam 2-6% slopes, NoA-Norfolk loamy sand 0-2% slopes, and NoB- Norfolk loamy sand 2-6% slopes.

No soil on JB CHS allows longleaf pine to out-compete loblolly pine in terms of volume production. Soils with a high site index for longleaf pine will normally have a higher site index for loblolly pine, a major longleaf competitor. Multiple examples of this can be observed on past longleaf plantings on JB CHS. Therefore, to minimize this competition and enable longleaf seeding success sites planted with longleaf pine will undergo intensive site preparation before planting.

Prior to 2019 on JB CHS, plantings of longleaf occurred after a site preparation treatment consisting of broadcast herbicide (Arsenal plus Accord) followed by a site preparation controlled burn. Poor residual properties in the herbicides used, lack of herbaceous weed control in the first two years after planting, slow root development due to wet or compacted soils, shading by residual hardwoods, and over topping by naturally seeded loblolly prevented planted longleaf seedlings from flourishing. The result has been longleaf plantations with marginal survival overtopped by loblolly and residual hardwoods creating a mixed stand at best.

With approval to this INRMP (2020) hardwoods will be removed from longleaf conversion sites during harvest. Allowing residual hardwoods to remain in an area being converted to longleaf pine is not a

recommended silvicultural practice for a number of reasons. First, longleaf is the most shade intolerant southern pine and shade from residual hardwoods would hamper growth and survival of planted longleaf seedlings. Second, the herbicides typically broadcast for effective longleaf site preparation will injure any residual hardwoods. And third, the site preparation burn followed by future successive burning will serially damage any residual hardwood in the stand. Well managed longleaf stands have little or no hardwood components.

Clear-cut sites should be allowed to naturally regenerate the first growing season after harvest. Typically, a tract should be chemically treated at the end of the first growing season after harvest operations if all harvesting is complete prior to 15 April. The tracts should be examined prior to chemical site preparation to determine if sufficient natural regeneration is present to treat and carry a site preparation burn. Tracts should be chemically treated from 15 July to 15 August, if possible. Any tract without sufficient regeneration as of mid-August should be allowed to lay-over and be treated from 15 July to 15 August the following year. Waiting a full year prior to treatment allows the site to regenerate not only the existing loblolly pine seed in the top soil layers but also any other competitive plant species and effectively expose them to the control measures.

The following chemical site preparation treatment is recommended: 32 oz./acre CHOPPER® Gen 2 plus 3 quarts/acre GARLON® XRT plus 5 quarts /acre of Accord® plus 2 oz. / acre Detail plus 2 oz. / acre Oust XP® with 1 quart/acre methylated seed oil (MSO) at a minimum of 25 gallons per acre (GPA) mid-July to mid-August.

Treated sites will be monitored and an initial site preparation burn conducted as soon as the treated fuels are fully available. Depending on vegetation type and density this may be anywhere from two to six weeks following chemical treatment. However, timing of the burn is critical and should occur as soon as weather and fuel conditions allow following chemical treatment. The site preparation burn should be conducted in an efficient manner to burn as much fuel, including heavy debris, as possible.

Each cutover site should be examined after the site preparation burn to determine if further treatments such as bedding with V-shear should occur. Bedding is a site preparation process which can provide great benefit to planted seedlings, especially on wetter sites. Early seedling survival and root collar diameter growth is vital for longleaf seedlings to exit the grass stage in a faster, more efficient manner. The faster a longleaf seedling exits the grass stage the greater the chance of the seedling becoming a part of the mature over-story. A two year study found that root collar diameter is greatest for seedlings planted on wet sites when herbicides and bedding is used in combination with one another (Knapp et al.).

Any bedding will be completed in such a manner as to not impede surface water movement on the site. All beds should be formed perpendicular or in a herringbone pattern to streams and drainages. Bedding does not need to be severe or oversized. A single pass bed should be sufficient. If heavy debris exists after the burn the bedding may be accomplished in conjunction with a V-shear to move the debris from the bedded area. Any bed formation which will "allow planting the seedling above the water table" will benefit root development. If bedding is recommended, the beds should be allowed to naturally settle for a minimum five to six week period. Improved containerized longleaf seedlings should then be planted on the beds from November 1st to January 31st on a 10' X 10' spacing resulting in 435 trees planted per acre.

It is generally recommended planting densities less than 600 trees per acre be utilized to re-establish longleaf savannah ecosystems. Additional sunlight is needed to establish herbaceous layers but sufficient tree density is also required to develop proper tree form. The 10' X 10' spacing is sufficient for seedlings to develop good form and for equipment to apply herbaceous weed control during the grass stage, future woody release (if needed), and possible thinning later on. Additionally, with this density a 95% survival

rate will result in approximately 413 trees per acre after one year, which is significantly less than the maximum recommended number of trees suggested for longleaf savannah restoration.

The seedlings should be monitored the first and second growing season for herbaceous weed control needs. The site preparation chemical treatment should carry the seedlings through the first spring. The area should be closely examined the summer after planting to determine if an herbaceous treatment is needed during the second year after establishment. The chemical control of competition during the grass stage is vital for the seedlings to exit the grass stage.

When seedlings exit the grass stage they will form a large, visible, yellow-green terminal bud. This bud is referred to as a "candle". It is during this next stage, known as the "bottle brush" stage, seedlings will undergo quick height growth and grow above the herbaceous layer. At this point they very susceptible to damage from fire and woody competition. The stand should be evaluated for chemical release from woody competition at this time. The trees should be 2-5 years old and should be protected from both natural and prescribed fire. Once they begin to establish a thicker bark and additional height, a prescribed fire regime may be established. This will typically occur when the "bottle brush" saplings have formed limbs.

Once seedlings reach the sapling stage and have attained a height of 8 to 10 feet and beyond they will be resistant to all but the most intense fires. However, the stands should be examined by a qualified forester before re-initiating a burn regime. It is recommended the stand be prescribed burned every two to three years once burning begins. Large scale herbicide treatments should not be needed once the burning regime begins. However, selective pre-commercial thinning may be needed as trees grow in height and shade the forest floor. The additional shade may limit future herbaceous development. Selective thinning may be accomplished by chemical or mechanical means. Need for this should be determined between 8 to 15 years of age. If selective pre-commercial thinning is not required the stands should be examined for commercial thinning by age 20.

Loblolly Pine Reforestation for JB CHS Weapons and NAAF

In areas unsuitable for longleaf restoration, reforestation will be by planting loblolly pine in stands harvested at maximum rotation. Site preparation for reforestation may consist of both chemical and mechanical treatments, although chemical treatment followed by a controlled burn will be the preferred method because it is more cost effective and leaves valuable topsoil in place. Chemical treatments will be the same mixtures used for longleaf restoration. V-Shear and bedding may be required if heavy debris prevents planting after harvest.

Sites reforested with loblollly will generally be the wetter soils on the installation unsuitable for longleaf. Each harvested site should be examined by a qualified forester after chemical treatment and a site preparation burn to determine if additional treatments are needed, such as bedding, to ensure seedling survival and growth. Bedding is a site preparation process which can provide great benefit to planted seedlings, especially on wetter sites. Early seedling survival and root collar diameter growth is vital to future growth.

As on the longleaf sites, any bedding should be completed in such a manner as to not prohibit the movement of surface water on the site. All beds should be formed perpendicular or in a herringbone pattern to streams and drainages. Bedding does not need to be severe or oversized. A single pass bed should be sufficient. If heavy debris exists after the burn the bedding may be accomplished in conjunction with a V-shear to move the debris from the bedded area. Any bed formation which will "allow planting the seedling above the water table" will benefit root development. If bedding is recommended, the beds

should be allowed to naturally settle for a minimum five-six week period. Improved Loblolly seedlings should then be planted on the beds starting November 1st on a 8' X 10' spacing which will account for 544 trees per acre.

Following reforestation of any site with loblolly pine the area should be examined by a professional forester to determine survivability and the need for chemical release after the first season following reforestation. Any future thinning will follow the thinning recommendations listed above.

Prescribed Burning of Forested Stands for JB CHS Weapons and NAAF

An aggressive prescribed burning program designed to burn timber stands every three years will reduce forest fuels and thus wildfire damage potential. Additionally, these controlled fires promote stand health, growth, and enhance wildlife habitat. However, prescribed burns conducted in an overly aggressive manner can have detrimental effects in Southern pine stands. As SOP the Burn Boss should consult with the installation forester: durning the planning process, prior to ignition and throughout the course of the burn whenever possible. They should discuss weather parameters and conditions suitable for the stand(s) in question as well as optimum firing patterns and desired burn intensity. The goal is to meet resource objectives and silvicultural prescriptions while minimizing crown and bole scorch and feeder root damage thereby preventing conditions that encourage subsequent insect attack and/or disease and mortality.

Forestry Income for JB CHS Weapons and NAAF

Income from timber sales will be used primarily to support reforestation efforts, maintenance and replacement of forestry equipment and vehicles, and forest access road improvements. JB CHS Weapons has an extensive forest road system of over 100 miles that receives heavy use from recreational, security and natural resource personnel. When financial support from installation operations and the limited forestry budget is insufficient to meet annual road bed repair and culvert and ditching maintenance needs other mitigation measures such as road limitations and closures may be utilized.

Weapons Station Forest Types

Figure 7-2 shows the forest types present on JB CHS Weapons. Forest types with respective acreages are provided in Table 7-2.

Table 7-2. Timber types and acerages at Joint Base Charleston Weapons.

Timber Type	Number of Acres
Loblolly Pine	5,256 Acres
Loblolly Pine-Mixed Hardwood	2,577 Acres
Longleaf Pine	592 Acres
Loblolly Pine-Longleaf Pine	433 Acres
Mixed Hardwood	57 Acres
Total	**8,915 Acres**

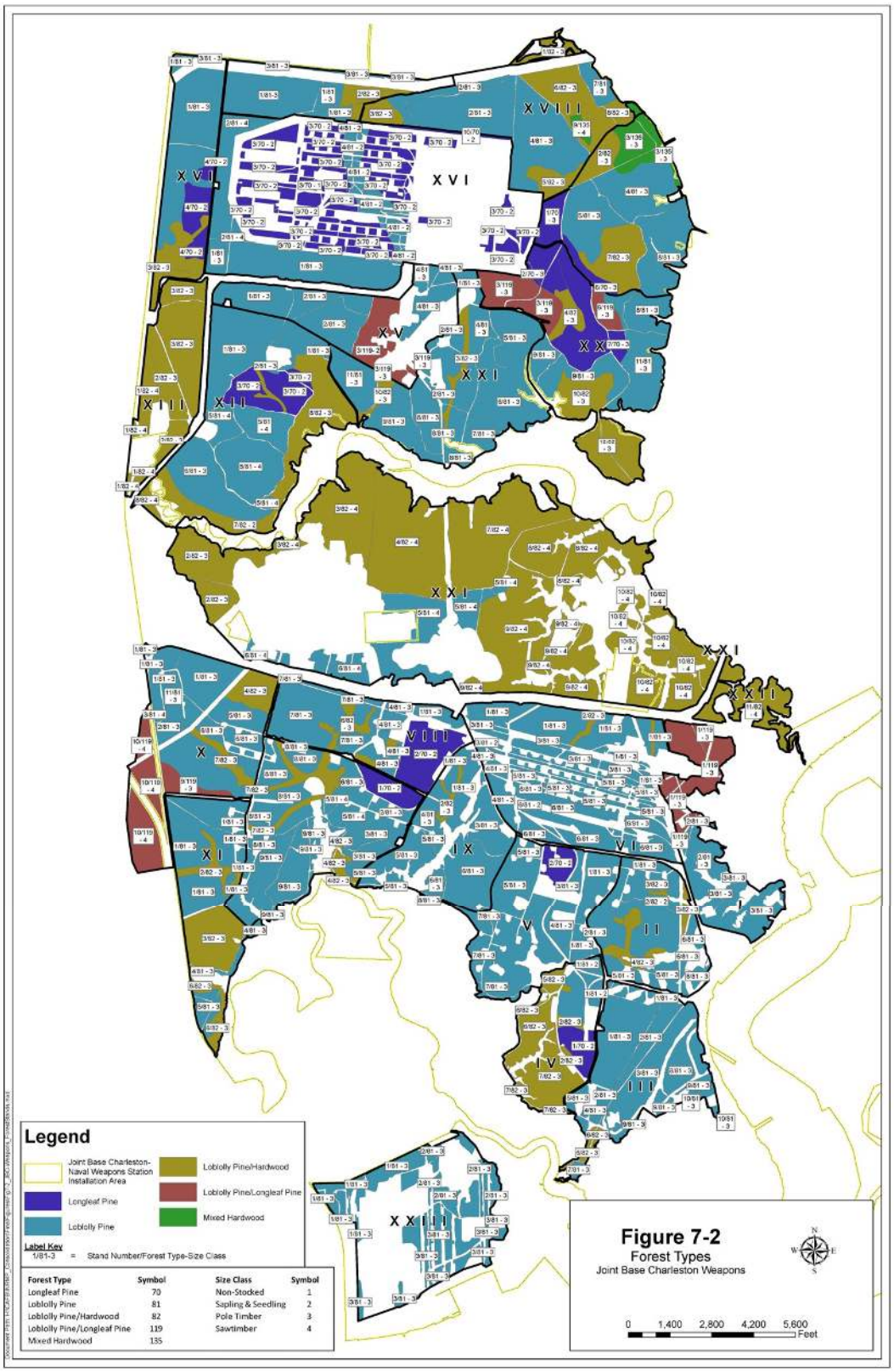


Figure 7-2. Forest types – Joint Base Charleston Weapons

7.9 Wildland Fire Management

Program Overview/Current Management Practices

Information provided in this chapter is from the Wildland Fire Management Plan (Section 15.0)**.**

History and Frequency of Wildfires on the Installation

No wildfires have been documented on JB CHS Air or NAAF.

Twenty-three wildfires have been documented at JB CHS Weapons. Most were quickly contained and damages were limited, but a wildfire in the mid-1980s consumed several hundred acres, and one in 2004 burned 50-60 acres. Table 7-7 shows the documented wildfires that have occurred at JB CHS Weapons. The security of the Base limits access to military personnel and Base civilian employees, reducing the threat of wildfire from human events on the Base. The majority of wildfires coming onto JB CHS Weapons are a result of debris discarded on adjacent highway rights of way.

Threat of Wildfire to the Mission and Natural Resources

Wildfires on JB CHS Air should be small and easily contained by Mutual Aid and JB CHS Air fire department personnel because of the small amount of wildland and the practice of mowing regularly. Impacts to the mission and natural resources would not likely be significant.

Wildfires on NAAF would have the potential to negatively affect the mission by interfering with flight training activities. Depending on the extent of the wildfire, loss of valuable timber resources and damange to utility poles carrying electric power and communiction lines could be significiant. Fallen trees on access roads and fence lines would require extensive repair and clean-up. If a wildfire originating on NAAF moved off onto private property questions of liability and compenstation would arise.

Similar considerations, but exponentially greater, are present at JB CHS Weapons. Thousands of acres of timberland sourrounding housing faciities, explosive magazines, administrative and training areas are present on the Weapons side. Significant damage to infrastructure has been avoided in the past due to an aggressive prescribed burning program and prompt responses by JB CHS Fire Department and SCFS.

Table 7-7. History of wildfires at Joint Base Charleston Weapons

Date	Location	Size	Cause	Responders
1970s	Marrington Mary's Landing Road	25-35 acres	Unknown	
Mid-1980s	Eastside Ordnance Area	Several hundred acres	Cigarette butt from car on North Rhett	Natural Resources and JB CHS WS Fire Dept.
Mid-1980s	Marrington	Boy Scout Cabin burned down	Unknown	Self-contained
Late 1980s	Northside, Big Island	Three acres	Unknown	Self-contained
Early 1990s	Marrington	Several small woods fires	Human	JB CHS NR (NR)
2004	Northside, south of Poseidon Pky	Five acres	Unknown	Natural Resources and JBC CHS WS Fire Dept.
2004	Northside, Between Poseidon Pky and HLS/DTP facility	50-60 acres	Unknown	Natural Resources and JBC CHS WS Fire Dept.
2005	Northside	12 acres	SCE&G crew dropped a hot wire	JBC CHS WS Fire Dept. NR and SCFC crews
2007	Northside, Poseidon Parkway road shoulder	one acre, several fires in right of way	Unknown	Natural Resources and JBC CHS WS Fire Dept.
2007	Bldg. 91	100 sq. ft.	Rail car brakes locked throwing sparks	JBC CHS WS Fire Dept.
2007	Missile Haul Rd.	five acres	Unknown	JBC CHS WS Fire Dept.
2008	Northside, Inside mag area 55 - 51	five acres	Hot wire drooping down from power line	Self-contained
2008	MinRiv Elementary/ Commissary	½ acre	Unknown	JBC CHS Fire Dept.
2009	Bldg. 3408	5' x 5' area	Human – cigarette	Self-contained
2010	North Rhett Avenue	One acre	Unknown	JBC CHS Fire Dept.
2010	Red Bank Road	Five separate fires	Unknown	JBC Fire Dept.
2010	Bushy Park Road	15 acres	Down power line	Mutual Aid Fire Depts.
2010	Knutson Street near Bldg. 780	Small brush fire	Unknown	JB CHS WS Fire Dept.
2011	Red Bank Road	7 separate road shoulder fires	Unknown	JB CHS WS Fire Dept.
2012	Northside NW Corner of Base	25 acres	Lighting Strike	JB CHS Weapons F.D. Nat Res and SCFC
2012	Next to Marrington Middle School immediately behind NNPTC	One acre	Lighting strike contained by existing fire breaks	Natural Resources and JBC CHS WS Fire Dept.

Date	Location	Size	Cause	Responders
2014	Northside ASLAC area	80 acres	Heavy Vehicle Training at ASLAC oval track	Natural Resources and JBC CHS WS Fire Dept.
2018	Eastside Ordnance Area along H. Brown Blvd	2 acres	Unknown	Mutual Aid Fire Depts. and JBC CHS WS Fire Dept.
2019	Northside Ordnance Area off of Lima Way behind Mag 11X062	1 acre	Unknown	Self-contained

Organizational Structure For Wildland Fire Protection and Wildfire Response Protocalls

Wildfires are reported through the 9-1-1 system, which then dispatches appropriate response personnel. In most cases this will be the closest fire department station. The on-scene Incident Commander then makes the determination as to whether additional resources are needed and requests those resources through the dispatch center. The WFPM should be contacted to conduct an on-scene determination and assist the fire department in requesting resources primarily the Shaw Wildland Support Module (WSM), if available, and secondarly the S.C. Forestry Commission..

The JB CHS Fire Department is the primary respondent for all base wildfires. If a wildfire moves beyond the “escaped fire” or incipient stages of a wildfire, the on-site Incident Commander or WFPM will declare it a wildfire and if necessary make a request to the Shaw WSM or SCFC that they take control of the event. Additionally, the Fire Department will notify the Emergency Dispatcher and the Fire Alarm Control Center. If the incident occurs in the munitions storage area the WFPM will notify NMCLANT and Explosive Safety.

At NAAF, the fire department immediately contacts SCFC and activates local Volunteer Fire Departments under the Mutual Aid Agreements. NAAF fire personnel do not have wildland firefighting equipment, but would be available in a supporting role with their regular equipment.

All fires starting in the vicinity of ammunition or explosives shall be reported and fought immediately with all available means to prevent the spreading of fire and munitions involvement. However, if fire engulfs explosives material or is supplying heat to it, or if the fire is so large that it cannot be extinguished with the equipment on hand, personnel involved shall evacuate and seek safety (AFMAN91-201, 10.9.4).

Wildfires may be managed under prescribed conditions and allowed to burn when approved by the WRPM and the JB CHS Fire Department. This approval will be based on an agreed upon plan to contain the wildfire within specific boundaries/firebreaks using back fires and fire suppression where appropriate to contain the fire.

Use of Prescribed Fire and Program Objectives

JB CHS Weapons has long had an active prescribed fire program. Table 7-8 shows activity in this program from 2003 to 2019. With Joint Basing and the addition of nearly 2,000 acres at NAAF to the prescribed fire program the annual goal has increased to 3,000 to 4,000 acres per year with a three-year rotation for each fire management compartment. Due to the limited number of burning days available because of weather conditions and military mission constraints, there will be some years where this goal will not be attained.

Table 7-8. Prescribed fire history on Joint Base Charleston Weapons, 2003-2019

Year	Executed Burn Plans	Acres	Average Acres per Burn	Unexecuted Burn Plans
2003	16	3,658	229	0
2004	18	3,817	212	6
2005	14	2,172	227	7
2006	17	3,729	219	1
2007	18	3,810	212	0
2008	14	3,180	227	0
2009	21	3,653	174	0
2010	16	2,913	182	3
2011	15	2,488	166	6[1]
2012	13	3,322	256	17[2]
2013	02	467	213	28[3]
2014	11	1,955	178	9
2015	25	5,503[4]	220	9[5]
2016	17	2,872	169	12
2017	4	1,494	75	29[6]
2018	12	3,564	149	11[7]
2019				

1 Program suspended in mid-March due to grass fire on magazines
2 Six Burn areas not available due to AF explosive safety regulations
3 Building 780 incident resulted in safety stand down
4 Includes 627 acres at NAAF
5 Crews from Wildland Fire Center did not begin burning until May
6 Four plans (units) completed, portions of five others burned over 20 burn days
7 Twelve plans (units) completed, portions of seven others burned over 24 burn days

Prescribed fire is used predominately on JB CHS Weapons and NAAF to accomplish the goals and objectives in the INRMP and secondarly reduce the threat of wildfire. See Section 15.0 for complete information on the JB CHS Wildland Fire Management Program.

See Section 15.0 for complete informantion on the installation's Wildland Fire Program.

7.10 Agricultural Outleasing

JB CHS does not have lands in an agricultural out-leasing program and this section is not applicable.

7.11 Integrated Pest Management Program

Program Overview/Current Management Practices

JB CHS has a pest management plan and an active pest management program (628 CES 2011). The Integrated Pest Management Plan (IPMP) for JB CHS describes the installation's pest management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety, and environmental requirements of the program. The program uses DoD and state of South Carolina certified government and contract pest management technicians to control pests. Pests included in the plan are invasive/noxious weeds and other unwanted vegetation, termites, mosquitoes, crawling insects (ants, crickets, cockroaches, etc.) and spiders, non-native invasive bird species, mice, moles, and other vertebrate pests. Without control, these pests could interfere with the military mission, damage real property, increase maintenance costs and expose installation personnel to diseases.

The objective of the pest management plan is to keep the pest population at an acceptable level through a variety of pest control techniques, aggressive surveying methods, mechanical, biological, non-chemical, and chemical controls to form an efficient, integrated pest management program.

The JB CHS Entomology shop implements the pest management program. All pest management work on the Base is conducted and/or monitored by Entomology, golf course or NR certified pest applicators.

The NR staff supports the IPMP by sharing the results of invasive species surveys conducted on the installation, conducting limited applications of pesticides and providing assistance as needed to identify noxious and invasive species.

<u>Exotic, Invasive, Nuisance, and Feral Species</u>

An exotic species is defined as a non-indigenous (non-native) species that was either purposefully or accidentally introduced into an area outside its natural range. Invasive species are alien species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health. In natural areas, the definition of invasive species is expanded to include aggressive plants that produce a significant change in terms of composition, structure, or ecosystem functions (Cronk and Fuller, 1995). Executive Order 13112, Invasive Species (February 3, 1999) requires executive agents to restrict the introduction of exotic organisms into natural ecosystems.

The Federal Noxious Weed Act of 1974 (7 U.S.C. 2801-2814) provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce. It defines noxious weeds as "any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation, or the fish and wildlife resources of the United States or the public health, and includes kudzu (*Pueraria lobata Dc*)" (7 U.S.C. 2802 (c)).

The most recent exotic and invasive species survey (and management plan) on JB CHS Air was conducted in 2011 (Section 15.0). Invasive plant species are classified as either a severe threat or a significant threat according to South Carolina's invasive plant species list (CU 2009):

> ***Severe threat*** - exotic plant species possesing characteristics of invasive species and spread easily displacing native vegetation especially including species that are or could become widespread.
>
> ***Significant threat*** - Exotic plant species possesing some invasive characteristics, but have less impact on native plant communities; they may have the capacity to invade natural communities along disturbance corridors, or to spread from disturbed sites into undisturbed areas, but have fewer characteristics of invasive species than those ranked as a severe threat.

The 2011 survey and management plan for JB CHS Air included a variety of potential control measures for invasive species currently present. Appropriate chemical, biological, and mechanical controls were recommended. Presently, JB CHS Air conducts spot chemical and mechanical control of kudzu and limited coyote trapping.

An "Invasive Species Management Plan" for the Weapons Station was completed in 2018 (Section 15.0). This plan identified ten species of invasive plants as the highest priority for control work. Work guided by this plan begins in 2018 and will continue and is funded for the next several years.

JB CHS Weapons currently has targeted control efforts underway for the following species:

- Chinese Privet (*Ligustrum sinense*) (ground herbicide application, mowing);
- Chinese Tallow Tree (*Triadica sebiferum*) (ground herbicide application, mowing);
- Giant Cane (*Arundo donax*) (ground herbicide application);
- Golden Bamboo (*Phyllostachys aurea*) (aerial herbicide application);
- Japanese Climbing Fern (*Lygodium japonicum*) (aerial herbicide application);
- Kudzu (*Pueraria lobata*) (aerial herbicide application);
- Phragmites (*Phragmites australis*)
- Silverthorn (*Elaeagnus pungens*)
- Wisteria (*Wisteria sinensis*)
- Feral hogs (authorizing deer hunters to take hogs; special hog hunting season; hog trapping program). NR staff will supervise a Feral Hog Control Team consisting of JB CHS Game Wardens are authorized to conduct trapping and euthanasia as well as special hunts to control hog populations.
- Coyote trapping

Multiple species at JB CHS Weapons are listed on the S. C. state list of noxious weeds (Table 7-9).

Table 7-9. Exotic, invasive, nuisance and feral species occurring on Joint Base Charleston

Animals	JB CHS Air Main	JB CHS Air NAAF	JB CHS Weapons
Feral Hog (*Sus scrofa*)			✓
Coyote (*Canis latrans*)	✓	✓	✓
Beaver (*Castor canadensis*)			✓
Nine-banded Armadillo (*Dasypus novemcinctus*)	✓		✓
Feral Cat (*Felis catus*)	✓		✓
Red Imported d *(Solenopsis invicta*)	✓	✓	✓
Mole Cricket (*Scapteriscus borellii*)			✓
Plants			
Severe Threat			
Privet (*Ligustrum sinense*)	✓	✓	✓
Japanese Honeysuckle (*Lonicera japonica*)	✓	✓	✓
Kudzu (*Pueraria lobata*)	✓	✓	✓
Chinese Tallow Tree (*Triadica sebiferum*)	✓		✓
Chinese Wisteria (*Wisteria sinensis*)	✓		✓
Asian Spiderwort (*Murdannia keisak)*		✓	
Autumn Olive (*Elaeagnus umbellata)*	✓		✓
Silverthorn (*Elaeagnus pungens*)			✓
Nepal Grass *(Microstegium vimineum*)		✓	
Bahia Grass *(Paspalum notatum)*	✓	✓	✓
Common Reed (*Phragmites australis*)			✓
Significant Threat			
Mimosa (*Albizia julibrissin*)	✓	✓	✓
Chinaberry (*Melia azedarach*)		✓	✓
Nandina (*Nandina domestica*)	✓		

Table 7-9. (continued).

Plants	JB CHS Air Base	JB CHS Air NAAF	JB CHS Weapons
English Ivy *(Hedera helix)*	✓		
Giant Cane (*Arundo donax*)			✓
Lespedeza Bicolor (*Lespedeza bicolor*)			✓
Japanese Climbing Fern (*Lygodium japonicum*)			✓
Rattlebox (*Sesbania punicea*)			✓
Cogon Grass *(Imperata cylindrica)*			?
Watch List or Not Listed on SC Invasive Species List			
French Tamarisk (*Tamarix* gallica) Watch List			✓
Sericea Lespedeza (*Lespedeza cuneata*)			✓
Johnsongrass (*Sorghum halapense*) ?			✓
Alligator Weed (*Alternanthera philoxeroides*)			✓
Water Hyacinth (*Eichorniacrassipes*)			✓
Brazilian Elodea (*Egeria Densa*)			✓
Eurasion Watermilfoil (*Myriophyllum spicatum*)			✓
Hydrilla (*Hydrilla verticillata*)			✓
Purple Loosestrife (*Lythrum salicaria*)			✓
Water Primrose (*Ludwigia hexapetala*)			✓
Threat levels are from CU 2009. *Species in **bold font** are list of South Carolina State-listed Noxious Weeds (NRCS 2012).*			

The installation will, to the extent practicable and permitted by law, not authorize, fund, or carry out activities that are likely to cause the introduction or spread of feral dogs, cats, pigs, goats or other non-native domesticated animals. When necessary feral animals will be removed using federally approved techniques. Feeding or harboring of feral domesticated species is prohibited.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

Program Overview/Current Management Practices

Birds and wildlife have the potential to cause millions of dollars in damage to aircraft and the loss of human life. The NR staff have participated in the JB CHS BASH program since its inception. *JB CHS Instruction 91-2121, The Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program* (1 August 2010) (Section 15.0), provides BASH guidance at JB CHS Air and NAAF.

The 437 Airlift Wing/Flight Safety Office (AW/SEF) Wing has the primary responsibility for the BASH program at JB CHS. Awareness of BASH threat is of paramount importance to flight crew safety and the surrounding community. JB CHS utilizes procedures to deal with the BASH threat based on the bird migration period (i.e., during periods of high migration) and the level of birdstrike incidents.

The instruction identifies three types of BASH threats:

3. Migratory bird threat (both the Air Base and NAAF are adjacent to the Atlantic Flyway, a major migratory bird route);

4. Indigenous bird threat; and

5. Local wildlife threat (e.g., deer, coyotes, foxes, etc.).

JB CHS has outlined procedures for two seasonal BASH Phases: Phase 1 is in effect during periods when the local bird population is comprised mostly of indigenous birds rather than migratory species. There are no flight restrictions during Phase I periods. A Phase II period is established during increased periods of migratory bird activity. Schedulers must make every effort to not schedule takeoffs, landings, and low-level flights from one hour before to one hour after sunrise and sunset during the Phase II period.

Separately from BASH phases described above, JB CHS ranks bird watch conditions (BWC) as follows:

- Bird watch condition LOW is defined as no significant threat of bird activity in the local pattern. Flying operations are not restricted;

- Bird watch condition MODERATE is defined as concentrations of 10 to 15 large birds (egrets, waterfowl, raptors, gulls, etc.) or 15 to 30 small birds (terns, swallows, etc.) observed in locations that represent an increased potential for strike; and

- Bird watch condition SEVERE is defined as heavy concentrations of birds (more than 15 large birds or 30 small birds) on or above the runway, taxiways, in-field areas and departure or arrival routes or in areas that represent an imminent hazard to safe flying operations.

The different BWC levels may result in restricted flying operations.

JB CHS Instruction 91-2121 also includes provisions for the following:

- **Establishment of a Bird/Wildlife Hazard Working Group:** The BHWG is an interagency effort tasked with implementing measures that provide the best chance of avoiding a collision between birds/wildlife and aircraft. NR is represented on the BHWG.

- **Birdstrike determination:** This guidance is used to determine the presence of a bird strike, as well as methods to avoid duplicate reports.

- **Deer population control:** Attained through recreational hunting (at NAAF only), depredation, and non-lethal methods of control.

- **Vegetation, insect control, and depredation:** This section contains requirements for the Base Civil Engineer regarding vegetation management on the airfields and throughout the installation (e.g., grass height on the airfield, ditch clearing, removal of standing water in non-wetland areas, insect control, and obtaining federal and state wildlife depredation permits).

Communication between Wing Flight Safety, the Base Civil Engineer, Charleston Air Traffic Control, the USDA BASH wildlife biologist, and 628 CES/CEIE, the Command Post, and other entities is crucial, and must be vigilantly maintained to ensure a safe flying environment. NR personnel participate in the BHWG, providing input regarding protection of natural resources and compliance with MBTA, ESA, and BGEPA.

7.13 Coastal Zone and Marine Resources Management

Program Overview/Current Management Practices

The SC Coastal Management Program was established under the guidelines of the national Coastal Zone Management Act (1972) as a state-federal partnership to comprehensively manage coastal resources. It was authorized in 1977 under South Carolina's Coastal Tidelands and Wetlands Act with the goal of achieving balance between the appropriate use, development, and conservation of coastal resources in the best interest of all citizens of the state. The South Carolina Coastal Zone is comprised of coastal waters and submerged bottoms seaward to the state's jurisdictional line as well as the lands and waters of the eight coastal counties. Both the JB CHS Air and JB CHS Weapons are located in the coastal zone.

South Carolina DHEC's Office of OCEAN and Coastal Resource Management (DHEC-OCRM) is the designated state coastal management agency and is responsible for the implementation of the state's Coastal Management Program. Implementation includes the direct regulation of impacts to coastal resources within the critical areas of the state including coastal waters, tidelands, beaches and beach dune systems; and indirect certification authority over federal actions and state permit decisions within the eight coastal counties.

The SC Coastal Management Program also includes the direct permitting of storm water and land disturbances in the coastal zone in coordination with the state-wide storm water permitting program.

The 628 ABW has the authority to review and approve construction projects on JB CHS. They have delegated that authority to 628 CES/CEIE, who conducts a Coastal Zone Consistency Review for projects that either disturb greater than one acre or disturb greater than ½ acre and are located within ½ mile of a state coastal receiving water.

In accordance with JB CHS Municipal Storm Water System (MS4) permit, JB CHS Weapons monitors storm water outfalls. Both JB CHS Air and Weapons conduct quarterly benchmark sampling based on storm events. JB CHS also conducts annual fecal coliform sampling in the Ashley River.

7.14 Cultural Resources Protection

Program Overview/Current Management Practices

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, and any other physical evidence of human activity considered important to a culture or community for scientific, traditional, religious, or other reasons. Numerous laws and regulations address the management of these cultural resources. These federal laws are in place to consider the effects of an agency's proposed activities when a site could be negatively impacted. 628 CES/CEIE is the JB CHS organization with primary responsibility for protecting cultural resources and assuring compliance with all applicable laws.

As a federal agency, JB CHS is required by law to consider the effects of its actions on historic properties prior to implementing the actions. Mandating regulations are the Antiquities Act of 1906, the Historic Sites Act of 1935, NEPA, the National Historic Preservation Act (NHPA) of 1966 as amended, 36 CFR Part 800, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the American Indian Religious Freedom Act of 1978.

The act that is most directly related to cultural resources management at JB CHS is the NHPA. Section 106 of the NHPA requires that federal agencies analyze the impacts of federal activities on historic properties, or cultural resources included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Section 110 of the NHPA requires that federal agencies inventory any cultural resources that are located on their property or within their control and to nominate those found to be significant for inclusion into the National Register.

Areas that proposed mission activities could potentially impact are identified and analyzed through the Air Force Environmental Impact Analysis Process (EIAP). Mitigation measures are developed to minimize potential impacts. By defining zones of archaeological or historic high probability, project planners and managers are able to make decisions whether or not to relocate a proposed activity from an area of high to low probability, therefore avoiding costly adjustments later in the project.

The current ICRMP for JBC CHS was officially reviewed in 2017. The ICRMPs explain laws which govern cultural resources; goals, responsibilities and objectives of the JB CHS cultural program; JB CHS's existing cultural resource inventory; Standard Operating Procedures; and various procedural, management, and budgeting issues.

No buildings or facilities on Joint Base Charleston have been determined eligible for the National Register of Historic Places (NRHP). The installation has 131 recorded archaeology sites. Of these sites 21 are considered eligible for the NRHP.

One eligible site is located on the Air Base. Site 38CH1022, is in the clear zone of one of the runways, was the site of Andre Michaux's botanical garden. The Air Base has one prehistoric site in Hunley Park. Six prehistoric sites and eleven historical archaeological sites were located and evaluated on the NAAF. None qualified for NRHP listing. All other remaining eligible sites are located on the Weapons Station (WS).

Weapons Station investigations have resulted in the designation of two historic districts as eligible for the NRHP. These two districts contain 13 of 20 eligible WS sites (6 individually eligible and 7 contributing). Thirteen of the 20 WS sites have been identified as individually eligible. Six state protected cemeteries are included in the archaeology site total but have not been evaluated for the NRHP. Twenty-one of the original 113 archaeology sites required further investigation and have been determined not eligible.

DoD Instructions 4715.3 and 4715.16 and AFI 32-7065 require cultural resources management programs be integrated with natural resources programs. This coordination makes certain, to the maximum extent feasible, that the Air Force complies with all applicable executive orders and federal natural and cultural resources statutory and regulatory requirements. This coordination ensures that cultural resources are not negatively impacted by NR activities (i.e., prescribed burning and timber operations).

7.15 Public Outreach

Program Overview/Current Management Practices

The primary focus of the NR staff is on mission support and resource management and protection, but public outreach is a critical component of any natural resource management agency. Without the support of partner organizations and local citizens, many management programs cannot succeed. The goal of public outreach efforts is to encourage understanding of, support for, and involvement in the many management and monitoring programs at JB CHS.

JB CHS Weapons has developed a number of public outreach activities, including participation in "National Public Lands Day," "Beach Sweep, River Sweep," and United Way's "Day of Caring." Additionally, the "Take One, Make One" youth hunter mentoring program is conducted on base in cooperation with the S.C. Department of Natural Resources. This program allows youth (12 to16) to access the installation hunting activity under the direct supervision of SCDNR officers and/or JB CHS Natural Resources Program volunteers. Installation hunting licenses and background checks are waived for this activity. TOMO hunting activities may involve any species of game animal authorized for hunting on JB CHS.

Wounded Warrior hunting events are conducted annually. Following guidelines laid out by the base legal office this is an all-volunteer event hosted but not endorsed by JB CHS. JB CHS license requirements are waived, regularly scheduled hunts may be curtailed and separate harvest quotas and restrictions are established for these events.

NR personnel conduct outdoor recreation safety classes for all-terrain vehicles (ATV). In addition a vigorus Hunter Safety Education Program certifies hundreds of hunters annually. Growth of outdoor recreation was marked by the institution of a Recreational Pass program to facilitate public access. Annually, approximatley 300 passes are issued along nearly 1,000 Installation hunting and fishing licenses. In addition, a 22-mile long multi-use recreational trail is maintained and augmented annually by a corps of Natural Resource Program volunteers.

Articles regarding public outreach activities are regularly authored by NR personnel and published on the JB CHS website. The JB CHS website also has an "Environmental Concerns" section that includes general environmental information and provides an avenue for the public to ask questions or express environmental concerns.

7.16 Climate Change Vulnerabilities

Program Overview/Current Management Practices

JB CHS Air Base. The majority of the maintenance facilities along the flight-line, Base shops, and housing areas eventually drain into the Ashley River. Flooding occasionally occurs due to flat topography, high water table, and extensive wetlands. As summarized in the JBCHS climate change assessment (section 14.2), floodplain modeling was conducted along the Ashley River using climate projection data. This floodplain modeling exercise projected the extent and impact of flooding due to frequent (high-recurrence interval) rainfall events for the timeframes of years 2030 and 2050 and under the RCP conditions of 4.5 (moderate carbon cuts) and 8.5 (unchecked pollution), using projected climate data and the associated change in vegetation cover, to help with installation planning and preparedness. Table 7-10 presents the projected changes in flooded area due to rainfall events.

Table 7-10. Projected inundation from stream channel overflow at JB CHS Air Base.

	Baseline	RCP 4.5		RCP 8.5	
	2000	2030	2050	2030	2050

Projected inundation (acres)	11.95	11.95	11.71	11.95	11.95
Change in inundation area from baseline (acres)		0	-0.24	0	0
Percent change from baseline		0%	-2%	0%	0%

Source: JBCHS Climate Change Assessment (section 14.2).

JB CHS North Auxiliary Airfield. The southern portion of the installation near the North Fork of the Edisto River is classified as Southeastern Floodplains and Low Terraces. As summarized in the JBCHS climate change assessment (section 14.2), floodplain modeling was conducted along the Edisto River using climate projection data. This floodplain modeling exercise projected the extent and impact of flooding due to frequent (high-recurrence interval) rainfall events for the timeframes of years 2030 and 2050 and under the RCP conditions of 4.5 (moderate carbon cuts) and 8.5 (unchecked pollution), using projected climate data and the associated change in vegetation cover, to help with installation planning and preparedness. Table 7-11 presents the projected changes in flooded area due to rainfall events.

Table 7-11. Projected inundation from stream channel overflow at NAAF.

	Baseline	RCP 4.5		RCP 8.5	
	2000	2030	2050	2030	2050
Projected inundation (acres)	248.2	229.6	221.9	303.5	291.7
Change in inundation area from baseline (acres)		-18.6	-26.3	55.3	43.4
Percent change from baseline		-7.5%	-10.6%	22.3%	17.5%

Source: JBCHS Climate Change Assessment (section 14.2).

JB CHS Weapon Station. Due to the proximity to the coast JB CHS Weapons area is vulnerable to flooding due to sea level rise and storm surge. Additionally, climate assessments project some increase in precipitation (frequent and high-recurrence interval rainfall events) for the years 2030 and 2050 under the RCPs 4.5 and 8.5. Due to the proximity of the JB CHS Weapons area to the coast, a vulnerability assessment was conducted using exposure to sea level rise and storm surge using a DoD site specific scenario database (see *JBCHS Climate Change Assessment*, section 14.2). Coastal flooding projections were modeled for RCP 4.5 and RCP 8.5 emission scenarios in 2035 and 2065 in accordance with the DoD scenario database. Estimates of sea level rise (SLR) and storm surge (SS) are provided in Table 7-12.

Based on this assessment, SLR is projected to reduce installation area by between 18% (RCP 4.5 in 2035) and 23% (RCP 8.5 in 2065). Existing tidal marsh areas are the most vulnerable to SLR inundation. Projections for a 20-year SS, which have a 5% probability of occurring any given year, estimate possible inundation of between 7116 acres (42% of the instillation area) for the RCP 4.5 scenario in 2035 to 7464 acres (44% of the installation area) for the RCP 8.5 scenario in 2065. Projections for a 100-year SS,

which have a 1% probability of occurring in a given year, estimate possible inundation up to 8146 acres (48% of the installation area) for the RCP 8.5 scenario in 2065.

Table 2-12. Acres of projected SLR and SS inundation at JB CHS Weapons.

Climate Scenario		2035		2065	
		Projected inundation (acres)	Percent of installation area inundated	Projected inundation (acres)	Percent of installation area inundated
RCP 4.5	SLR	3122	18%	3495	21%
	20-yr SS	7116	42%	7241	43%
	100-yr SS	7670	45%	7935	47%
RCP 8.5	SLR	3501	21%	3829	23%
	20-yr SS	7241	43%	7464	44%
	100-yr SS	7694	45%	8146	48%

Source: JBCHS Climate Change Assessment (section 14.2).

7.17 Geographic Information Systems (GIS)

Program Overview/Current Management Practices

The following GeoBase goals were adopted by the USAF Civil Engineer Automation Steering Group in November 1999 for management of GIS data:

- Recognize geospatial information resources as vital USAF mission assets warranting investment, management, and exploitation;
- Acknowledge that cultural change issues such as user understanding, acceptance and stewardship are far more critical to successful use of geospatial information resources than the specific technology;
- Employ a strategic planning process to guide the long-term development and mission impact assessment of organizational geospatial information resource investments;
- Increase accountability, reduce investment risk, and better correlate mission needs with current technology and market conditions by pursuing long-term geospatial information resource aims through phased modular projects;
- Ensure past, current, and future geospatial information resource management investments are inventoried, managed, and exploited in a shared forum to avoid wasteful redundancies;
- Validate the appropriateness of existing sources of geospatial information prior to investing in new geospatial data collection efforts;

- Employ available data and quality assurance standards to maximize interoperability, minimize application development costs, and protect the geospatial information resource investment;

- Seek to provide all mission elements with controlled, ready access to a geo-referenced common operational picture of the target mission space via established communication networks;

- Assign geospatial information owners with the responsibilities for maintaining, protecting, and stewarding their functional information assets;

- Protect their geospatial information resources at a level commensurate with the risk and magnitude of harm that could result from disclosure, loss, misuse, alteration, or destruction of the information;

- Facilitate sharing their geospatial information resources to the maximum extent allowable both across and beyond the installation with other federal, state, municipal, or international agencies; and

- Recognize the need to establish a skilled cadre of full-time personnel to develop, implement, and sustain long-term use of geospatial information resource investments to support the mission.

GeoBase is an Air Force program for geospatial information management. It is a tool that can be used to form and implement excellent planning and land use decisions. The first GIS workstation was purchased by JB CHS in fiscal year 1996; all GIS data are currently being converted to GeoBase standards.

The JB CHS GeoBase system is used as an integral part of natural resources management. The GeoBase network represents a suite of tools that can be used to enter, access, analyze, and plot geospatial data. The natural resources data set contains data layers such as soils, wetlands, recreational trails, hunting areas, prescribed fire maps, forest stands, hydrography, floodplains, and vegetation cover.

The GeoBase data layers are valuable for managing wetland protection efforts, National Environmental Policy Act (NEPA) review, monitoring implementation, wildland fire management, recreational activity, forest management and T&E species enhancements. Data layers can be easily compiled and customized to create maps for visual analysis and to facilitate spatial measurements such as area and distance calculations. Other related uses include providing material for a web page and information brochures, making current information on resources and plans implementation readily available, and having easily producible graphics available for special presentations or reporting and coordination needs.

Current GeoBase data can be used to support coordination, planning, analysis, and documentation functions of base personnel. Projects utilizing the GeoBase greatly improve data accessibility and provide for a cost-effective approach to expanding the user base. As GeoBase users gain an understanding of the advantages of the system and achieve greater operational capability, the quality and efficiency of tasks such as NEPA review will improve. Similarly, new applications of the information will become evident. Examples of new applications include compiling and planning maintenance needs (e.g., miles of fence-line to be replaced, or roadside to be mowed, forest access roads to be maintained), or informative displays for public relations or agency consultation purposes.

To fully comply with DoD Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE), this INRMP prescribes the following database management practices:

The data gaps identified in current GIS data should be fully updated during future surveys by requiring practices that include the acquisition of the data associated with each field and its respective subtype. Of

those attribute fields that are identified as incomplete, JB CHS should review the attributes and decide if the values should remain as <Null>, or be completely deleted if the attributes do not apply.

8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and supporting objectives to manage and protect natural resources while supporting the military mission. Goals express a vision for a desired condition for the installation's natural resources and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF missions, this section may list specific goals and objectives aimed at eliminating, reducing, or mitigating the effects of encroachment on military missions. These natural resources management goals for the future have been formulated by the preparers of the INRMP from an assessment of natural resources, current condition of resources, mission requirements, and management issues previously identified. Below are the integrated goals for the natural resources program.

The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement – Management Goals and Objectives

8.1 GIS Management

Goal 8.1.1: Enhance, update, and maintain GIS data.

Objective 8.1.1.1: Ensure current Base natural resources information is updated and incorporated into the GeoBase by December 2022.

> Project 8.1.1.1.1: Collect existing natural resources data (SDSFIE compliant) and standardize with GeoBase.

Objective 8.1.1.2: Annually review natural resource GIS information to ensure current coverage.

> Project 8.1.1.2.1: Review natural resources GIS spatial data and update to include such layers as land cover and forest tract status annually.

Objective 8.1.1.2: Maintain synchrony between base GIS data base and GeoBase: updating annually

> Project 8.1.1.3.1: Sync annually the natural resources GIS database with GeoBase database.

Goal 8.1.2: Use GIS information as a tool for developing future natural resource management goals and objectives.

Objective 8.1.2.1: Assess annually natural resources management needs for additional GIS data collection

> Project 8.1.2.1.1: Review annually all natural resource GIS files and compile a list of coverage into a spreadsheet determining gaps in information.

8.2 Fish and Wildlife Management

Goal 8.2.1: Preserve, protect, and manage wildlife habitats to ensure healthy, productive wildlife populations using an ecosystem-based management approach.

Objective 8.2.1.1: Enhance wildlife habitat annually on JB CHS Weapons by manipulating plant successional stages, plantings, and providing nesting locations.

Project 8.2.1.1.1: Enhance wildlife habitats on road shoulders (10 miles), (ROWs - 30 acres) and wildlife openings (7) by mowing, disking, planting and burning to produce a diversity of habitats.

Project 8.2.1.1.2: Maintain (10) and expand wildlife orchards (1) planting hard and soft mast producing trees and shrubs as well as flowering species for pollinators thereby providing food resources, nesting habitat, and loafing areas.

Project 8.2.1.1.3: Maintain (60) and/or construct nest boxes (15) and nesting platforms for a wide diversity of species.

Goal 8.2.2: Maintain good working relationships with agencies involved in wildlife management.

Objective 8.2.2.1: Communicate annually with state and federal fish and wildlife agencies.

Project 8.2.2.2.1: Hold annual INRMP meeting with SCDNR and USFWS to discuss fish and wildlife management issues and re-visit INRMP goals and objectives. Notes will be recorded and filed from these meetings to document the annual review process.

Project 8.2.2.2.2: Annually, receive, monitor and report on the SCDNR's Nuisance Wildlife Depredation Program permits in by 30 January.

Project 8.2.1.1.3: Apply for, deliver and monitor state and federal wildlife depredation permits in coordination with installation Safety and BASH personnel.

8.3 Threatened and Endangered Species Management

Goal 8.3.1: Manage and protect federally listed Threatened and Endangered species and habitats.

Objective 8.3.1.1: Update surveys for rare, threatened and endangered species as needed.

Project 8.3.1.1.1: Annually, conduct the U.S.D.I.'s National Mid-winter Eagle survey.

Project 8.3.1.1.2: In consultation with SCDNR and USFWS conduct surveys for state and federal T & E and at-risk plant and animal species beginning in 2023

Objective 8.3.1.2: Implement projects that provide direct and indirect benefits to federally or state-listed species, species of concern, and their habitats.

Project 8.3.1.2.1: Per federal agencies approval and INRMP (7.4.3 Pg 109) requirements (which averted "Critical Habitat" designation for known endangered Atlantic and shortnose sturgeon in the Cooper River) maintain un-improved and improved forest access roadbeds, ditches and culvert systems to minimize eroision and resulting sediment which lowers water quality adversly impacting sturgeon.

8.4 Nuisance and Invasive Species Management

Goal 8.4.1: Identify and control invasive plant species.

Objective 8.4.1.1: Annually monitor and control invasive species.

Project 8.4.1.1.1: Annually treat infestations of high priority terrestrial, invasive species identified in 2018 Invasive Species Management Plan.

Project 8.4.1.1.2: Identify and survey aquatic invasive species and beginning annual treatment in 2020.

Project 8.4.1.1.3: Annually monitor, hunt and trap (as necessary) wild hogs, coyotes and beavers.

8.5 Management of Wetland and Waters of the U.S.

Goal 8.5.1: Conserve and protect wetlands and their natural functions.

Objective 8.5.1.1: Comply with state and federal wetland regulations as well as Air Force and DoD Regulations, Policies, and Directives.

Project 8.5.1.1.1: Maintain communication with USACE and request JB CHS be included on the USACE mailing list for special public notices, regulatory guidance letters, and information papers directing policies affecting wetlands.

Objective 8.5.1.2: Comply with EO 13186 Memorandum of Understanding between the DoD and the USFWS to promote the conservation of migratory birds by March 2014, by maintaining and improving existing habitat and expanding where feasible, and documenting maintenance and expansion.

Project 8.5.1.2.1: Protect wetlands and associated habitat by reviewing all AF Form 332 and AF Form 813 that may impact wetlands.

Goal 8.5.2: Protect wetlands from operational activities at JB CHS maintaining functional wetlands

Objective 8.5.2.1:

Project 8.5.2.1.1: Control invasive and noxious weed species (see Project 8.4.1.2.2) in wetlands and allow native species to re-populate as much as possible.

Project 8.5.2.1.2: Maintain existing wetland board walks and docking in base wetlands.

8.6 Grounds Maintenance and Land Management

Goal 8.6.1: Implement beneficial landscaping/grounds maintenance reducing erosion and improving wildlife habitat.

Objective 8.6.1.1: Improve coordination with operations and planning personnel working with them to integrate natural resource recommendations into grounds maintenance contracts.

Project 8.6.1.1.1: Maintain regular communication with grounds maintenance staff and provide input to grounds maintenance contacts.

Project 8.6.1.1.2: Work cooperatively with operations and planning personnel to annually identify improved grounds for conversion to semi-improved acreage and semi-improved grounds for conversion to unimproved acreage; converted improved and semi-improved acres would be managed as additional natural vegetation restoration areas; semi-improved grounds would be mowed to maintain a height of 7-14 inches.

Project 8.6.1.1.3: Periodically monitor areas converted to semi-improved or unimproved acreage to assess invasive species concentrations and the effects of the conversions on the military mission and direct herbicide applications at appropriate rate to control invasive species populations as needed.

Objective 8.6.1.2: Minimize adverse effects to natural resources from grounds activities.

Project 8.6.1.2.1: NR manager will review new construction projects, landscape designs and Grounds Maintenance contract revisions to integrate and ensure consistency with INRMP land management goals and objectives.

Project 8.6.1.2.2: Ensure noxious and invasive weed removal is included in the grounds maintenance installation contract by annually meeting with Grounds Maintenance personnel responsible for developing the contract.

Goal 8.6.2: Make maximum use of regionally native plant species and avoid introductions of invasive and non-native species in re-vegetation and landscaping activities.

Objective 8.6.2.1: Use native grass and forb mixtures when re-seeding as necessary, to re-vegetate across the Base as needed in semi-improved and unimproved areas by 2020.

Project 8.6.2.1.1: Ensure an approved native plant species list is incorporated in the current and all future Grounds Maintenance contracts through meetings with the Grounds Maintenance and any other landscaping personnel by January 2019.

Objective 8.6.2.2: Use only Base approved seed mixes for improved areas and seed as necessary.

Project 8.6.2.2.1: Reference Project 8.6.2.1.1 – approved native plant species list.

8.7 Forest Management

Goal 8.7.1: Continue development and management of "urban forest" trees on Base.

Objective 8.7.1.1: Continue to implement urban forestry practices in developed areas and maintain the JB CHS Tree City USA program.

Project 8.7.1.1.1: Review all planned tree maintenance (i.e., removal, pruning, planting, and fertilization) for effects on urban forests annually.

Project 8.7.1.1.2: Review annually and update as needed JB CHS Tree Ordinance in conjunction with Tree City USA renewal.

Project 8.7.1.1.3: Annually meet criteria for Tree City USA including an Arbor Day Ceremony.

Goal 8.7.2: Protect and manage woodlands on the installation.

Objective 8.7.2.1: Continue to practice the ecosystem management concept for sustained yield of forest products and to promote forest health at JB CHS Weapons and NAAF.

Project 8.7.2.1.1: Periodically harvest and sell forest products: all activities will be conducted per the JB CHS Forest Management Plans.

Project 8.7.2.1.2: Conduct prescribed burns annually in managed timber stands to meet wildland wildfire management goals of: ecosystem restoration, wildlife habitat enhancement, and facilitate timber management activities; prescribed burns will average 3,000 to 4,000 acres per year with a three-year rotation and will be implemented in accordance with the JB CHS WFMP.

8.8 Wildland Fire Management (see Section 15.0, Tab 1).

Goal 8.8.1: Annually meet the goals and objectives of the WFMP.

Objective 8.8.1.1: Annually review and update the WFMP and burn program records.

Project 8.8.1.1.1: Conduct annual planning meeting with Shaw WSM in June to discuss fuel reduction projects, burn unit preparation, training, equipment needs, and program improvements and WFMP revisions in preparation for the next burning season.

Project 8.8.1.1.2: Annually update: 1) the base "Prescribed Fire Map" with the upcoming burn season's targeted burn units ranked in priority; 2) master e-mail notification list; and, 3) burn records, burn unit histories and burn maps.

Goal 8.8.2: Provide for the safety of installation personnel, the public and wildland fire personnel and for the protection of Base infrastructure and real property.

Objective 8.8.2.1: In relation to wildland fire, the safety of personnel will be achieved through meetings, notifications, training, use of personal protective equipment, and the acquisition and maintenance of necessary equipment as set forth in the WFMP.

Project 8.8.2.1.1: Wildland Fire personnel will participate in annual safety refresher training and attend individual prescribed fire operations safety briefing as available.

Project 8.8.2.1.2: Necessary equipment and PPE will be purchased annually.

Project 8.8.2.1.3: NR staff will attend SC Prescribed Fire Council Meetings and other available training classes annually.

Objective 8.8.2.2: Protection of Base infrastructure and real property will be accomplished by the planning, preparation, and execution set forth in Section 3.5.2.3 of Chapter 3 in the WFMP.

Project 8.8.2.2.1: Fire Breaks and clear zones will be maintained annually under the direction of the WFPM per Section 3.10 in Chapter 3 of WFMP.

- **Goal 8.8.3: Minimize wildfire threat.**

Objective 8.8.3.1: Reduce wildland fire fuel loads by implementation of policies and procedures as laid out in Chapter 3 "Wildland Fire Management & Wildfire Risk Mitigation" of the base WFMP.

Project 8.8.3.1.1: Conduct prescribed fires on an average of 3,000 to 4,000 acres annually with each individual fire management area being burned once every three years.

Project 8.8.1.1.2: Coordinate and cooperate with the JB Fire Department and the SCFC.

Project 8.8.3.1.3: Maintain Mutual Aid Agreements with the local community fire departments.

- **Goal 8.8.4: Achieve the JB CHS's INRMP resource management goals and objectives that are dependent on use of prescribed fire.**

Objective 8.8.4.1: See Section 3.6.3 of WFMP.

Project 8.8.4.1.1: Endangered species management

Project 8.8.4.1.2: Control of invasive species

Project 8.8.4.1.3: Restoration of native ecosystems

Project 8.8.4.1.4: Management of timber

Project 8.8.4.1.5: Enhancement of wildlife habitat

Project 8.8.4.1.6: Maintenance of ephemeral wetlands

Project 8.8.4.1.7: Promoting the aesthetic appeal

Goal 8.8.5: Generate support for wildland fire management and prescribed fire at JB CHS.

Objective 8.8.5.1: Educate military and civilian population regarding benefits of prescribed fire.

Project 8.8.5.1.1: Conduct an annual campaign to educate and inform JB CHS personnel regarding the importance and occurrence of prescribed fire. Venues for informational and educational materials will include: annual Prescribed Fire Program e-mail distributed to the members of the Prescribed Fire E-mail Notification List, articles on the JB CHS web site, notices posted at the

Marrington Trail System trail head and the Marrington Hunter Check Station and telephone conversations with tenant and unit prescribed fire POCs.

8.9 Bird Aircraft Strike Hazard Management

Goal 8.9.1: Minimize aircraft exposure to potential wildlife strike hazards.

Objective 8.9.1.1: Facilitate Safety Department's management of the BASH Program annually.

Project 8.9.1.1.1: Coordinate with state and federal agencies to receive necessary depredation permits and supply annual reports.

Project 8.9.1.1.2: Attend BHWG meetings and Airfield Operations Board Meetings.

8.10 Outdoor Recreation Management

Goal 8.10.1: Improve the quality of life at JB CHS and surrounding communities by providing facilities and information that encourage natural resource based outdoor recreation and educational on JB CHS.

Objective 8.10.1.1: Re-develop existing Marrington Watchable Wildlife Area by October 2022.

Project 8.10.1.1.1: Repair and maintain Watchable Wildlife Area infrastructure.

Project 8.10.1.1.2: Update and reprint Watchable Wildlife Area supporting literature.

Objective 8.10.1.2: Maintain fishing opportunity in Marrington by October 2022.

Project 8.10.1.2.1: Replace small fishing dock at Marrington' s James Pond.

Objective 8.10.1.3: Provide a safe, well-maintained recreational trail system annually.

Project 8.10.1.3.1: Maintain a core of 6-12 volunteer trail workers to assist in the maintenance and expansion of the recreational trail system.

Project 8.10.1.3.2: Maintain the JB CHS Weapons 22-mile recreational trail system.

Project 8.10.1.3.3: Maintain the one-mile JB CHS Air Natural Awareness Trail.

Goal 8.10.2: Provide recreational hunting opportunity to military and civilian community.

Objective 8.10.2.1: Conduct an annual hunting and fishing program allowing authorized military and civilian personnel opportunity to harvest Base game and fish species.

Project: 8.10.2.1.1: Set annual harvest limits for fish and game species considering previous harvest, INRMP goals and objectives, and species monitoring reports.

Project: 8.10.2.1.2: Provide annually pre-season hunt schedules for authorized game species and installation policies and procedures, hunt maps and other supporting documentation to hunters.

Project 8.10.2.1.3: Issue hunting and fishing permits in compliance with Hunting and Fishing Program Plan and maintain spreadsheets on permits and records of game harvested annually.

Project 8.10.2.1.4: Assess installation deer and turkey population annually to provide data-based management decisions for evaluating the number of permits to issue.

Project 8.10.2.1.5: Conduct annually five SCDNR sponsored Hunter Safety Education Classes.

Project 8.10.2.1.6: Continue to serve as a sponsor and host location for the SCDNR "Take One, Make One" program which introduces young people to recreational hunting.

Project 8.10.2.1.7: Enroll in iSportsman program to increase recreational user's access to on-line information and services by May of 2021.

Goal 8.10.3: Comply with installation policies and procedures as well as state and federal fish and wildlife laws and regulations

Objective 8.10.3.1: Enforce annual hunter compliance with State and federal regulations as well as installation policies and procedures keeping records on violations an incidents.

Project 8.10.3.1.1: Recruit, train and supervise a corps of 20-30 volunteer game wardens annually conducting pre-season meetings for deer, waterfowl (2), wild turkey and a post season deer season meeting.

Project 8.10.3.1.2: Implement enforcement of state and JB CHS hunting regulations by coordinating with security forces and the SCDNR.

Objective 8.10.3.2: Provide professionally trained Conservation Law Enforcement by 2022.

Project 8.10.3.2.1: Train a DoD Conservation Law Enforcement Officer.

8.11 Cultural Resource Protection

Goal 8.11.1: Protect NRHP level cultural resources from natural resource activities impacts.

Objective 8.11.1.1: Ensure that NR personnel are aware of locations and significance of NRHP level cultural resources particularly archeological sites.

Project 8.11.1.1.1: Include cultural resource awareness in annual Prescribed Fire training emphasizing to personnel involved with fire break work the locations of cultural sites.

Project 8.11.1.1.2: Review all timber contracts for potential impacts on cultural resources.

Project 8.11.1.1.3: Review all project proposals, AF Form 332 and AF Form 813 for impacts.

8.12 Public Outreach

Goal 8.12.1: Promote natural resource education and awareness and beneficial relations with surrounding communities via natural resource based activities and events.

Objective 8.12.1.1: Develop activities and outreach events on the Base and community annually.

Project 8.12.1.1.1: Reference Project 8.7.1.2.2 – Conduct an annual Arbor Day event.

Project 8.12.1.1.2: Continue to participate in the South Carolina Beach/River Sweep, an annual statewide litter clean-up and educational campaign.

Project 8.12.1.1.3: Continue to participate in the SCDNR's "Take One, Make One" youth hunter mentoring program.

Project 8.12.1.1.4: Continue to conduct and bi-annual Wounded Warrior hunting events

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

Implementation of this INRMP requires staffing by three natural resource professionals: a Biological Scientist (Environmental), GS-0401-(51)-12, an Environmental Protection Specialist GS-0028-11, and a Forester GS-0460-11. Current staffing deficiencies are a Conservation Law Enforcement Officer and a Natural Resource Technician at the GS 7-9 level.

9.2 Monitoring INRMP Implementation

The Installation will complete the annual Defense Environmental Program Annual Report to Congress (DEP-ARC) data call. This data call requests information on Natural Resources Conservation Metrics as described in DoDI4715.03, including INRMP Implementation, Sikes Act compliance, and Focus Areas.

9.3 Annual INRMP Review and Update Requirements

The SAIA requires that each INRMP be reviewed by the USFWS and SCDNR on a regular basis, but not less often than every five years. The SAIA specifies that the INRMPs be reviewed "as to operation and effect" emphasizing that the review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the SAIA and contribute to the conservation and rehabilitation of natural resources on military installations. Office of the Secretary of Defense Policy Memorandum, *Implementation of the Sikes Act Improvement Amendments: Supplemental Guidance Concerning INRMP Reviews*, states that the requirement to review an INRMP "on a regular basis, but not less often than every 5 years" does not mean that every INRMP necessarily needs a major revision. The need to revise an INRMP will be the decision of the installation based on the outcome of the review.

In addition to formal five-year reviews DoD policy requires each installation to complete an annual evaluation. The USFWS and SCDNR will be invited to participate in this annual evaluation. The base or wing commander, or designee, will certify the annual review. The annual review will verify that:

- All "must fund" projects and activities have been budgeted for and implementation is on schedule;
- All required natural resources positions are filled or are in the process of being filled;
- Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not require revising the INRMP if goals and objectives remain unchanged;
- All required coordination with the USFWS and SCDNR has occurred; and
- Any significant changes to the installation's mission or its natural resources have been identified.

10.0 ANNUAL WORK PLANS

Programmed Year Project Title	Funding Source	Priority Level
FY2020		
Mgt, Invasive Species	O & M	High
Mgt Invasive Wildlife	O & M	High
Monitor, Wetlands	O & M	High
Supplies, CN	O & M	High
Equip Purchase/Maintain	O & M	High

FY2021		
Mgt, Invasive Species	O & M	High
Mgt Invasive Wildlife	O & M	High
Supplies, CN	O & M	High
Equip Purchase/Maintain, CN	O & M	High
FY2022		
Mgt, Invasive Species	O & M	High
Mgt Invasive Wildlife	O & M	High
Supplies, CN	O & M	High
Equip Purchase/Maintain, CN	O & M	High
FY2023		
Mgt, Invasive Species	O & M	High
Mgt Invasive Wildlife	O & M	High
Supplies, CN	O & M	High
Equip Purchase/Maintain, CN	O & M	High
Conduct T & E reptile & amphibian survey	O & M	High
FY2024		
Mgt, Invasive Species	O & M	
Mgt Invasive Wildlife	O & M	
Supplies, CN	O & M	
Equip Purchase/Maintain, CN	O & M	
Conduct T & E plant survey on JB CHS Station	O & M	

11.0 REFERENCES

11.1 Standard References (Applicable to all USAF installations)

- AFI 32-7064, *Integrated Natural Resources Management*

- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook
- DoDI 4715.03, *Natural Resources Conservation Program*

11.2 Installation References

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12.0 ACRONYMS

12.1 Standard Acronyms *(Applicable to all USAF installations)*

- eDASH Acronym Library
- Natural Resources Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

ABW	Air Base Wing
AFB	Air Force Base
AFSBn-CHS	Army Field Support Battalion Charleston
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AICUZ	Air Installation Compatible Use Zone
AMC	Air Mobility Command
APHIS	Animal and Plant Health Inspection Service
AST	aboveground storage tank
ATV	all-terrain vehicle
AW	Airlift Wing
BA	basal areas
BASH	Bird Aircraft Strike Hazard
BCP	Bird Conservation Plan
BCW&SA	Berkeley County Water and Sewer Authority
BGEPA	Bald and Golden Eagle Protection Act
BHWG	Bird/Wildlife Hazard Working Group
BMP	Best Management Practice

- BRAC Base Realignment and Closure
- BWC bird watch conditions
- CAC Common Access Card
- CAFB Charleston Air Force Base
- CES/CEIE 628th Civil Engineer Squadron/Asset Management
- CFR Code of Federal Regulations
- CHLA Chlorophyll A
- CWA Clean Water Act
- CZMA Coastal Zone Management Act
- DBH diameter at breast height
- DO dissolved oxygen
- EIAP Environmental Impact Analysis Process
- DoD Department of Defense
- EO Executive Order
- EOD Explosive Ordnance Disposal
- EPA U.S. Environmental Protection Agency
- ESA Endangered Species Act of 1973
- ° F degrees Fahrenheit
- FEMA Federal Emergency Management Agency
- FLETC Federal Law Enforcement Training Center
- FLIR forward looking infrared
- GIS Geographic Information System
- ICRMP Integrated Cultural Resources Management Plan
- INRMP Integrated Natural Resources Management Plan
- IPMP Integrated Pest Management Plan
- JB CHS Joint Base Charleston
- JLUS Joint Land Use Study
- MBMP Migratory Bird Management Plan
- MBTA Migratory Bird Treaty Act
- MSL mean sea level
- NAAF North Auxiliary Airfield
- NAVCONBRIG Naval Consolidated Brig
- NCSD North Charleston Sewer District
- NEPA National Environmental Policy Act
- NHPA National Historic Preservation Act
- NIWC Naval Information Warfare Center Atlantic
- NMFS National Marine Fisheries Service
- NMCLANT Naval Munitions Command Atlantic, Unit Charleston
- NNPTC Naval Nuclear Power Training Command
- NOAA National Oceanic and Atmospheric Administration
- NPDES National Pollution Discharge Elimination System
- NPTU Nuclear Power Training Unit
- NR Natural Resources
- NRCS Natural Resource Conservation Service

- NRHP National Register of Historic Places
- OUSD Office of the Under Secretary of Defense
- OWS oil water separator
- PFM Prescribed Fire Manager
- PIF Partners In Flight
- POMFLANT Polaris Missile Facility Atlantic
- RCRA Resource Conservation and Recovery Act
- RCW red-cockaded woodpecker
- REPI Readiness Environmental Protection Initiative
- ROTC Reserve Officer Training Corps
- SAIA Sikes Act Improvement Act of 1997
- SCDHEC South Carolina Department of Health and Environmental Control
- SCDNR South Carolina Department of Natural Resources
- SCFC South Carolina Forestry Commission
- SCSFIE Spatial Data Standards for Facility, Infrastructure, and Environment
- SWMP Storm water Management Plan
- SWPPP Storm water Pollution Prevention Plan
- T&E threatened and endangered
- TDR Transfer of Development Rights
- TMDL Total Maximum Daily Load
- TMZ Territory Management Zone
- UFC Unified Facility Criteria
- USACE United States Army Corps of Engineers
- USAF United States Air Force
- USDA United States Department of Agriculture
- USFS United States Forest Service
- USFWS United States Fish and Wildlife Service
- UST underground storage tank
- WFMP Wildland Fire Management Plan
- WFPM Wildland Fire Program Manager
- WQMS Water Quality Monitoring Station

13.0 DEFINITIONS

13.1 Standard Definitions *(Applicable to all USAF installations)*

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

- None.

14.0 APPENDICES

14.1. Standard Appendices

Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources with emphasis is on inventory and stewardship of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, *Protection and Enhancement of Environmental Quality*	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, *Protection and Enhancement of the Cultural Environment*	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, *Exotic Organisms*	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, *Floodplain Management*	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, *Off-Road vehicles on Public Lands*	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, *Protection of Wetlands*	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harms have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for: (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction

	and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.
EO 12088, *Federal Compliance with Pollution Control Standards*	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (US EPA) authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 12898, *Environmental Justice*	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, *Exotic and Invasive Species*	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*	The USFWS has the responsibility to administer, oversee and enforce the conservation provisions of Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement and modification), international coordination & regulations development & enforcement.
United States Code	
Animal Damage Control Act (7 U.S.C. § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 U.S.C. § 7401– 7671q, July 14, 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response,	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up

Compensation, and Liability Act (CERCLA) of 1980 (Superfund) (26 U.S.C. § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	standards, assign liability, and other efforts to address environmental contaminants. Installation Restoration Program guides cleanups at DoD installations.
Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 U.S.C. § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the NOAA Fisheries (National Marine Fisheries Service) and the preparation of a biological evaluation or a biological assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 U.S.C. § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides federal aid to states for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 U.S.C. § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 U.S.C. § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 U.S.C. §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the US EPA.
Fish and Wildlife Conservation Act (16 U.S.C. § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 U.S.C. § 661 et seq.)	Directs installations to consult with USFWS, or state agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.

Lacey Act of 1900 (16 U.S.C. § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 U.S.C. § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural out-leasing program.
Migratory Bird Treaty Act 16 U.S.C. § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.
National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 U.S.C. § 4321 et seq.	Requires federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act [40 Code of Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 16 U.S.C. § 470 et seq.	Requires federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 U.S.C. § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges thru purchase, land transfer, donation, cooperative agreements and other means.
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a federal permit. Installations should coordinate with the U.S. Army Corps of Engineers

	(USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System (NPDES) and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 U.S.C. § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.
Soil and Water Conservation Act (16 U.S.C. § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other federal and local programs.
Sikes Act (16 U.S.C. § 670a–670l, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the Dept of the Interior (USFWS), and State Fish and Game Dept in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an INRMP and public access to natural resources and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in natural sciences to develop and implement installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 U.S.C. § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, August 4, 1983 (Revised May 29, 2003) does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for conservation and management of natural resources.
DoD Policy, Directives, and Instructions	
DoD Instruction 4150.07 *DoD Pest Management Program* dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, *Environmental Security*	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.

DoD Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.
OSD Policy Memorandum – 17 May 2005 – *Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands*	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.
OSD Policy Memorandum – 1 Nov 2004 – *Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews*	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum – 10 October 2002 – *Implementation of Sikes Act Improvement Act: Updated Guidance*	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process (EIAP)	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-7062, *Air Force Comprehensive Planning*	Provides guidance and responsibilities related to the USAF comprehensive planning process on all USAF-controlled lands.
AFI 32-7064, *Integrated Natural Resources Management*	Implements AFPD 32-70, *Environmental Quality;* DoDI 4715.03, *Natural Resources Conservation Program*; and DoDI 7310.5, *Accounting for Sale of Forest Products*. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.

AFI 32-7065, *Cultural Resources Management*	This instruction implements AFPD 32-70 and DoDI 4710.1, *Archaeological and Historic Resources Management.* It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFPD 32-70, *Environmental Quality*	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
Policy Memo for Implementation Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on Jan 29, 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

14.2. Installation Appendices

14.2.1 Climate Change Summary for Joint Base Charleston
14.2.2 Threatened and Endangered Species Surveys
14.2.3 Wildlife Survey and Deer Census Update
14.2.4 Small Mammal, Bird, and Bat Surveys
14.2.5 JB CHS Tree Ordinance
14.2.6 JB CHS Weapons Station Soil Report

15.0 ASSOCIATED PLANS

Tab 1 – Wildland Fire Management Plan

Tab 2 – Hunting and Fishing Program Plan

Tab 3 – Red-Cockaded Woodpecker Management Plan

Tab 4 – Invasive Species Management Plans: JB CHS Air & Weapons Station

Tab 5 – Migratory Bird Management Plan

Tab 6 – Wetland Protection Plan

Tab 7 – Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

Tab 8 – Golf Environmental Management (GEM) Plan

Tab 9 – Forest Management Plan