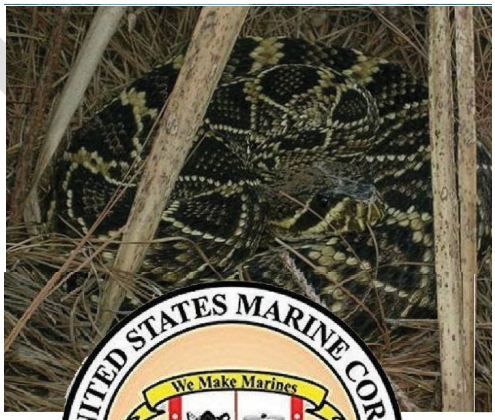
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN 2021 - 2026



MARINE CORPS
RECRUIT DEPOT PARRIS
ISLAND, SOUTH
CAROLINA

LEAD AGENCY & RESPONSIBLE CONTRIBUTORS

The lead agency for this assessment is the U.S. Marine Corps (USMC). The major responsible contributors are the Naval Facilities Engineering Command MIDLANT (NAVFAC MIDLANT), located in Norfolk, Virginia, and the Marine Corps Recruit Depot, Parris Island, South Carolina.

DESCRIPTION OF DOCUMENT

This report is a Natural Resources Management Plan for the Marine Corps Recruit Depot, Parris Island, South Carolina, for the adoption of a management plan for the next five years.

CONTACT PERSONS AT RESPONSIBLE COMMAND

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN, MARINE CORPS RECRUIT DEPOT, PARRIS ISLAND, SOUTH CAROLINA 2021-2026

The Sikes Act Improvement Act of 1997 requires that the proposed integrated natural resources management plans (INRMP) be prepared in cooperation with the U.S. Fish and Wildlife Service and the state Fish and Wildlife Agency and that the management of fish and wildlife in this INRMP reflect mutual agreement of the parties in accordance with the 2013 Memorandum of Understanding for a Cooperative Integrated Natural Resources Management Program on Military Installations. Mutual agreement is required only with respect to those elements of this Plan that are subject to the otherwise applicable legal authority (i.e., authority derived from a source other than the Sikes Act, such as the Endangered Species Act) of the U.S. Fish and Wildlife Service and the state Fish and Wildlife Agency to conserve, protect, and manage fish and wildlife resources.

To the extent that resources permit, the U.S. Fish and Wildlife Service (USFWS), South Carolina Department of Natural Resources (SCDNR), and Marine Corps Recruit Depot by signature of their agency representatives, do hereby agree to enter a cooperative program for the conservation, protection and management of fish and wildlife resources on the Installation. The intention of this agreement is to develop functioning, sustainable ecological communities on the Installation that integrates the interests and mission of the agencies charged with conservation, protection, and management of national heritage in the public interest. This agreement may be modified and amended by mutual agreement of the authorized representatives of the three agencies. The agreement will become effective upon the date subscribed by the last signatory and shall continue in full force for a period of five years or until terminated by written notice to the other parties, in whole or in part, by any of the parties signing this agreement.

By their signatures below, or an enclosed letter of concurrence, all parties grant their concurrence and acceptance of the following document.

APPROVING OFFICIALS:

Commanding General, Marine Corp Recruit Depot, Parris Island, South Carolina	**Date**
Environmental Division Director	**Date**
US Fish and Wildlife Service	**Date**
South Carolina Department of Natural Resources	**Date**

PLAN UPDATES

This INRMP should be updated annually, and reviewed and revised every 5 years by U.S. Department of Defense (DOD), USFWS, and State fish and wildlife agencies (DOD Instruction 4715.03). Updates and revisions are a necessary part of maintaining a proactive management plan. Ecosystem management is a dynamic process. Implementation of management goals and actions requires prescribed monitoring to measure the success of management goals. The table below is used to document annual updates, but these shall not replace the required 5-year review and revision. The 5-year review will incorporate information obtained during the annual update process. The section(s) being updated are recorded below to allow for quick cross-reference.

2021 through 2026 INRMP Revisions and Updates		
Year	**Comments**	**Reviewer**

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ACRONYMS

APHIS	Animal & Plant Health Inspection Service
CLEO	Conservation Law Enforcement Officer
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DOD	U.S. Department of Defense
DOC	U.S. Department of Commerce
DODINST	U.S. Department of Defense Instruction
DOI	U.S. Department of Interior
DON	Department of the Navy
EFH	Essential Fish Habitat
EO	Enforcement Officer
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
HQMC	Headquarters Marine Corps
INCRMP	Integrated Cultural Resources Management Plans
INRMP	Integrated Natural Resource Management Plans
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
MCCS	Marine Corps Community Services
MCO	Marine Corps Order
MCRD Parris Island	Marine Corps Recruit Depot, or “the Depot”

MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAVFAC	Naval Facilities Engineering Systems Command
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NREAO	Natural Resources and Environmental Affairs Office
NRM	Natural Resource Manager
P2 Plan	Pollution Prevention Plan
PIF	Partners in Flight
SAIA	Sike Act Improvement Act
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SWPPP	Stormwater Pollution Prevention Plan
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USC	University of South Carolina
USDA NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

This INRMP directs management of the natural resources of the Marine Corps Recruit Depot Parris Island, South Carolina (hereinafter referred to as MCRD Parris Island or "the Depot") in an ecosystem context that will be re-approved after five years and reviewed yearly.

PURPOSE AND NEED

The purpose of this document is to meet statutory requirements under the Sikes Act Improvement Act (SAIA), Public Law 105-85, Div. B. Title XXIX, 18 November 1997, 111 Stat 2017-2019, 2020- 2022. In November 1997, the Sikes Act, 16 U.S. Code (USC) § 670a *et seq.*, was amended to require the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate this program, the amendments require the Secretaries of the military departments to prepare and implement integrated natural resources management plans for each military installation in the United States unless the absence of significant natural resources on a particular installation makes preparation of a plan for the installation inappropriate.

The United States Department of the Navy (DON) has prepared this INRMP for the MCRD Parris Island to comply with the SAIA, DOD Instruction (DODINST 4715.03), Marine Corps Order (MCO) P5090.2 (Environmental Compliance and Protection Manual), and the Marine Corps' Handbook for Preparing, Revising, and Implementing INRMPs of October 2007.

Other than the mandated requirement, the primary purpose of the INRMP is to provide MCRD Parris Island with a foundation from which to manage the Depot's natural resources. The INRMP will guide the management of the Depot's natural resources for the next five years. The INRMP will account for the goals of the natural resources program within those five years, while supporting with the military mission of the Depot. The INRMP will also consider the surrounding natural resources through implementation of an integrated approach to management.

GOALS

The SAIA directs the DOD to manage its lands in support of the military mission. In light of this requirement, six overall drivers have been used to filter the chosen management schemes. First, the training of marine recruits is paramount at the Depot. Second, support of an improved quality of life for Marines (and their dependents) is the secondary driver. It is expressed by providing outdoor recreation and preventing wildlife damage and diseases. Third, Marine Corps and DOD guidance requires the use of ecosystem management to the extent it is compatible with the military mission and mission derived goals. This is frequently accomplished with participation in regional and state management initiatives such as South Carolina's State Wildlife Action Plan (South Carolina Department of Natural Resources [SCDNR] 2015). For MCRD Parris Island, ecosystem management derived goals will include the maintenance and restoration of natural communities, the maintenance and preservation of maritime forest, and the eradication or control of invasive exotic plants where practical. This all comes under the heading of providing "natural" forest areas with diverse wildlife

and plants, especially those rare and uncommon species usually found only in relatively undisturbed or restored habitats. Fourth, the Depot must comply with cognizant natural resources laws such as the Endangered Species Act (16 U.S. Code [USC] 1531 *et seq.*) and the Clean Water Act (33 USC 1251 *et seq.* [CWA]). Fifth, the natural resources will be utilized to provide commodities such as timber. And sixth, management and ecosystems will be monitored to insure satisfactory management and continued improvement in that management. Given these drivers, the following goals have been derived:

- Communicate regularly with the training commands to insure implementation of the INRMP is supporting the mission.
- Maintain extremely low fuel loads (to reduce wildfire) in and around the ammunition storage area and the Hazardous Waste Storage Facility by keeping pine straw and brush to a minimum.
- Maintain low fuel loads (to reduce wildfire), reduced brush (to reduce biting arthropods), and scenic woods adjacent to housing areas.
- Maintain low fuel loads and reduce brush in the woods utilized for training.
- Remaining lands will be managed for fish & wildlife oriented recreation, commodity extraction, and low pest and fuel loads.
- Maintain military readiness by protecting and managing endangered and threatened species. (This maintains readiness by insuring public confidence in the Marine Corps' ability to protect important natural resources while preparing for defenses of the country.)
- Manage the Installation to maintain biodiversity using the principles of sound ecosystem management.
- Provide public access for utilization of the Installation's natural resources to the extent that such access can be safely accommodated and is consistent with Installation mission and Security requirements.
- Monitor the success of the plan and the ecosystems around MCRD Parris Island.

FUNDING

Funding for implementation of the INRMP will come from the Depot or Headquarters Marine Corps natural resources fund sources from Marine Corps Headquarters (HQMC). The natural resources programs and projects described in this INRMP are divided into mandatory and stewardship categories to reflect implementation priorities.

Every effort will be made to acquire Marine Corps Environmental or other funding to implement DOD mandatory projects, in the timeliest manner possible. Stewardship-type projects will be funded through HQMC, Forestry Reserve Account or other fund sources as funding and personnel resources become available. Other possible funding sources, such as the DOD Legacy Resource Management Program, may be utilized when appropriate.

ORGANIZATION OF THE INRMP

Section 1 Overview. This section provides a general overview of the purpose and intent of the INRMP; the overall objectives of the INRMP as derived from the broad drivers and goals described in that section; and processes for review, implementation, and revision of the plan.

Section 2 History and Related Plans. This section establishes the importance of the military mission within the Marine Corps, discusses the organization of MCRD Parris Island, provides a brief overview of the natural resources program, identifies Depot partnerships and stakeholders, and briefly describes Depot plans, studies, and programs relevant to the natural resources program.

Section 3 Existing Environment. This section discusses the existing physical and biological characteristics of the local and regional environment. For example, included within this section are descriptions of the climate, geology, topography, soils, hydrology, vegetation, wildlife, and rare, threatened, and endangered species of the area.

Section 4 Natural Resources Management. This section discusses ecosystem management at the Depot by dividing management into four components: land management, forest management, fish and wildlife, and outdoor recreation. These components are further divided into subcomponents; for example, the land management discussion addresses wetlands, floodplain management, soil conservation and erosion control, stormwater/water quality control, landscaping and grounds maintenance, urban forestry and invasive, exotic, and noxious species. Objectives, long-term management, lists of proposed projects, legal requirements, and sources for additional management information are addressed under each subcomponent. This section also discusses management recommendations for law enforcement, staffing and training, monitoring, and INRMP reviews and updates.

Section 5 Natural Resources Project Implementation. This section provides more details about the proposed projects listed in Section 4. The projects are featured in a table that succinctly describes each project proposed for implementation by MCRD Parris Island. The tasks, cost, time frame, priority, and legal requirements are discussed for each project. It is the intent of MCRD Parris Island to implement the projects as described to the greatest extent possible. However, the implementation of projects is largely dependent upon availability of funds. Recognizing the uncertainties in funding and the possibility of changes to the military mission and its civilian and military staffing, the projects are ranked in priority from 1 to 3.

Appendices. The appendices provide additional information and documents addressing the management issues, objectives, and actions discussed in this INRMP.

APPROVAL OF THE INRMP

The INRMP is required to be signature-endorsed by the subject Depot's Commanding General. According to the SAIA, the INRMP must reflect mutual agreement with the U.S. Fish and Wildlife Service (USFWS) and the SCDNR. Mutual agreement will concern conservation, protection, and management of fish and wildlife resources, and will be represented by the signing of the appropriate agency representatives or by letter of endorsement.

REVISION PROCESS

In accordance with the Marine Corps Handbook for Preparing, Revising and Implementing Integrated Natural Resources Management Plans, this INRMP will be reviewed on a yearly basis and re- approved every five years. The review process will take into account changes in military mission requirements and legal mandates, and information obtained from monitoring programs and surveys.

Revisions will be reviewed for consistency with the military mission, federal and state laws, and the ecosystem management goals and objectives of the INRMP. The revision process will be conducted under the direction of the Depot Commanding General. Substantive revisions will require consultation with and approval by the Commanding General, the USFWS, and the SCDNR.

1.0 OVERVIEW

1.1 PURPOSE

The purpose of this document is to meet statutory requirements under the SAIA, Public Law 105-85, Div. B. Title XXIX, 18 November 1997, 111 Stat 2017-2019, 2020-2022. In November 1997, the Sikes Act, 16 USC § 670a *et seq*., was amended to require the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate this program, the amendments require the Secretaries of the military departments to prepare and implement integrated natural resources management plans (INRMPs) for each military installation in the United States unless the absence of significant natural resources on a particular installation makes preparation of a plan for the installation inappropriate.

The United States DON has prepared this INRMP for the Marine Corps Recruit Depot, Parris Island, South Carolina (hereinafter referred to as MCRD Parris Island or "the Depot"), to comply with the SAIA, DOD Instruction (DODINST 4715.03), Marine Corps Order (MCO) P5090.2 (Environmental Compliance and Protection Manual), and the Marine Corps Handbook for Preparing, Revising, and Implementing INRMPs of October 2007.

Other than the mandated requirement, the primary purpose of the INRMP is to provide MCRD Parris Island with a foundation from which to manage the Depot's natural resources. The INRMP will guide the management of the Depot's natural resources for the next five years. The INRMP will account for the goals of the natural resources program within those five years, while not interfering with the military mission of the Depot. The INRMP will also consider the surrounding natural resources through implementation of an integrated approach to management.

1.2 ECOSYSTEM MANAGEMENT

In November 1997, the SAIA, 16 USC 670 a, *et seq*., was amended to require the implementation of a program to provide for the conservation and rehabilitation of natural resources on military installations. The Marine Corps' approach for management of natural resources is holistic in that it incorporates an awareness of the broad regional setting in which the Depot is located. Appropriate and effective management of natural resources on Marine Corps lands will be achieved in accordance with the principles and practices of ecosystem management.

1.3 GOALS AND OBJECTIVES OF THE INRMP

The SAIA directs the DOD to manage its lands in support of the military mission. In light of this requirement, six overall drivers have been used to filter the chosen management schemes. First, the training of marine recruits is paramount at the Depot. Second, support of an improved quality of life for Marines (and their dependents) is the secondary driver. It is expressed by providing outdoor recreation and preventing wildlife damage and diseases. Third, Marine Corps and DOD guidance requires the use of ecosystem management to the extent it is compatible with the military mission and mission derived goals. This is frequently accomplished with participation in regional and state management initiatives such as South Carolina's State Wildlife Action Plan (South Carolina

Department of Natural Resources [SCDNR] 2015). For MCRD Parris Island, ecosystem management derived goals will include the maintenance and restoration of natural communities, fish and wildlife management, the maintenance and preservation of maritime forest, and the eradication or control of invasive exotic plants where practical. This all comes under the heading of providing "natural" forest areas with diverse wildlife and plants, especially those rare and uncommon species usually found only in relatively undisturbed or restored habitats. Fourth, the Depot must comply with cognizant natural resources laws such as the Endangered Species Act (ESA) (16 USC 1531 *et seq.*) and the Clean Water Act ([CWA] 33 USC 1251 *et seq.*). Fifth, the natural resources will be utilized to provide commodities such as timber. And sixth, management and the ecosystem will be monitored to insure satisfactory management and continued improvement in that management.

Given these drivers, the following goals have been derived:

- Communicate regularly with the training commands to insure implementation of the INRMP is supporting the mission.
- Maintain low fuel loads by keeping pine straw and brush to a minimum through prescribed burning in order to reduce wildfires and biting arthropods while improving scenic values.
- Remaining lands will be managed for fish & wildlife oriented recreation, commodity extraction, and low pest and fuel loads.
- Maintain military readiness by protecting and managing endangered and threatened species. (This maintains readiness by insuring public confidence in the Marine Corps' ability to protect important natural resources while preparing for defenses of the country.)
- Manage the Depot to maintain biodiversity using the principles of sound ecosystem management.
- Provide public access for utilization of the Depot's natural resources to the extent that such access can be safely accommodated and is consistent with Depot mission and Security requirements.
- Monitor the success of the plan and the ecosystem around MCRD Parris Island.

Under these goals, 24 objectives have been developed (provided in Table 1 below). Within any subsection of this plan, different objectives will apply.

Table 1. Objectives[1]	
DEPOT-WIDE	
1.	Prescribe burn pine and pine/hardwood stands while trying to mimic natural fire regimes.
2.	Control invasive species throughout the Depot.

Table 1. Objectives[1]	
3.	Maintain records and collect data of fish- and wildlife-based outdoor recreation to determine desired and needed activities.
4.	Provide fish- and wildlife-based outdoor recreation, including hunting, appropriate to the present resource base and compatible with military use of the Depot.
5.	Upgrade, refurbish, or replace at least one recreation facility every other year. Each improved facility will be made accessible to the handicapped.
6.	Determine species richness and diversity Depot-wide and by area of the Depot so biodiversity can be monitored and maintained.
7.	Determine indicator species or criteria for future monitoring of management actions.
8.	Maintain populations of all animals appropriate for the local area, habitats, and size of the Depot; maintain average or better populations for species determined to be declining in the region.
9.	Monitor the deer herd through collection of information from harvested deer supplemented with other studies as recommended by the state.
10.	Monitor, maintain, and provide a conservation benefit for endangered species on the Depot.
11.	Utilize bird and bat houses to increase populations of mosquito-eating birds and bats.
12.	Protect soils and wetlands using Best Management Practices during forestry operations.
13.	Protect wetland and water quality using a variety of techniques such as storm water retention/detention, buffer strips, and Best Management Practices.
14.	Maintain a low enough deer population, through hunting, to support increased biodiversity of other species, reduce or eliminate deer/auto collisions, and reduce tick populations.
15.	Mineral resources controlled by the Depot will not be sold or extracted.
16.	On most available land, produce a sustained yield of commercial timber products from native species in a manner consistent with ecosystem management.
17.	Implement beneficial landscaping and grounds maintenance practices to reduce erosion, prevent invasive species introduction into unimproved areas, and improve wildlife habitat.
18.	Maintain habitats with diverse native plant and animal populations.

Table 1. Objectives[1]	
19.	Maintain existing cooperative management for the areas covered by the shellfish cooperative agreement.
20.	Monitor harvest of horseshoe crabs and adjust as necessary to be sure their population is not adversely impacted.
21.	Maintain the attenuation capacity of the remaining undisturbed acreage within the 100-year floodplain.
PAGE FIELD	
1.	Maintain lands in a manner that best supports Depot training needs through frequent feedback with the training command.
2.	Conduct bird surveys to evaluate training impacts on migratory birds.
THIRD BATTALION POND	
1.	Monitor water quality in Third Battalion Pond and the estuary.
[1] Subject to availability of funding and personnel	

1.4 IMPLEMENTATION OF THE INRMP

Implementation of the INRMP will follow an annual strategy that addresses legal requirements, funding, implementation responsibilities, technical assistance, labor resources, and technological enhancements.

1.4.1 Legal Requirements

Legal requirements are laws, executive orders, regulations, directives, and memoranda regarding the protection and management of natural resources (Table 2). The INRMP will be updated as legal requirements change. Relevant legal requirements for natural resources management are presented throughout Section 4.

Table 2 *Legal Drivers for Natural Resources Management*	
Name/Description	**Citation**
Bald and Golden Eagle Protection Act of 1940, as amended	16 USC 688 *et seq.*
CWA of 1977, as amended	Public Law 95-217, 33 USC 1251 *et seq.*

Table 2 ***Legal Drivers for Natural Resources Management***	
Name/Description	**Citation**
Coastal Zone Management Act of 1972	16 USC 1451 *et seq.*
Coral Reef Protection	Executive Order 13089
Conservation Programs on Military Reservations (Sikes Act) of 1960, as amended	16 USC 670(a) *et seq.*
ESA of 1973	16 USC 1531 *et seq.*
Environmental Effects Abroad of Major Federal Actions	Executive Order 12114
Exotic Organisms	Executive Order 11987
Facilitation of Hunting Heritage and Wildlife Conservation	Executive Order 13443
Fish and Wildlife Conservation Act of 1980	16 USC 2901 *et seq.*
General Permit Process	50 Code of Federal Regulations (CFR) 13
Interagency Cooperation – Endangered Species Act of 1973, as amended	50 CFR 402
Invasive Species	Executive Order 13112
Leases: Non-Excess Property of Military Departments	10 USC 2667
List of Migratory Birds	50 CFR 10.13
Magnuson-Stevens Act Provisions	50 CFR 600
Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended	16 USC 1801 *et seq.*
Marine Mammal Protection Act (MMPA) of 1972, as amended	16 USC 1361 *et seq.*
Marine Protected Areas	Executive Order 13158
Migratory Birds Permits	50 CFR 21
Migratory Bird Treaty Act (MBTA) of 1918, as amended	16 USC 703 *et seq.*
Military Reservation and Facilities: Hunting, Fishing, and Trapping Act of 1958	Public Law 85-337, 10 USC 2671

Table 2 ***Legal Drivers for Natural Resources Management***	
Name/Description	**Citation**
National Environmental Protect Act (NEPA)	42 USC 4321 *et seq.*
Protection of Wetlands	Executive Order 11990
Recreational Fisheries, as amended by Executive Order (EO) 13474	Executive Orders 13474, Amendments to 12962
Regulations Governing the Taking and Importing of Marine Mammals	50 CFR 216
Responsibilities of Federal Agencies to Protect Migratory Birds	Executive Order 13186
SAIA of 1997	16 USC 670 et seq.
Sale of Certain Interests in Lands; Logs	10 USC 2665
Use of Off-Road Vehicles on the Public Lands	EO 11644
Source: MCO 5090.2, Volume 11 Natural Resources Management, Chapter 2 Authority	

1.4.2 Funding

Funding for implementation of the INRMP will come from the Depot or Headquarters Marine Corps (HQMC) natural resources fund sources. The natural resources programs and projects described in this INRMP are divided into mandatory and stewardship categories to reflect implementation priorities. Every effort will be made to acquire Marine Corps Environmental or other funding to implement DOD mandatory projects, in the timeliest manner possible.

Stewardship-type projects will be funded through HQMC, Forestry Reserve Account, or other fund sources as funding and personnel resources become available. Other possible funding sources, such as the DOD Legacy Resource Management Program, may be utilized when appropriate.

1.4.3 Implementation Responsibilities

The Commanding General is directly responsible for operating and maintaining MCRD Parris Island, including the implementation and enforcement of this INRMP, and is legally liable for complying with the laws involved with implementing this plan.

Management of Natural Resources at the Depot has been assigned to the Logistics Officer (G-4). Under the supervision and management of the Public Works (PWD) Officer, the Environmental Division (ENVDIV) Director directs and coordinates the management and maintenance of natural resources at MCRD Parris Island. The ENVDIV Director supervises a Natural Resources Manager (NRM), a Natural Resources Specialist (biologist) and a Conservation Law Enforcement Officer

(CLEO) who work on the natural resources program. Additional staff work on other environmental programs and may work with the natural resources program.

The ENVDIV Director and staff interface with many other departments in management of the resources. Examples include MCCS, the Parris Island Museum, housing and active duty Marines with the Recruit Training Regiment (RTR) and Weapons Field Training Battalion (WFTBn).

1.4.4 Technical Assistance

Technical assistance to MCRD Parris Island may be provided from within the DON or by outside agencies. Assistance from outside agencies is normally provided through individual agency requests and formal cooperative agreements, while assistance from within DON is normally less formal. During the five-year management period of this INRMP update, additional cooperative agreements may be implemented.

Technical assistance from organizations outside the DON will include:

- The United States Fish and Wildlife Service (USFWS) and the SCDNR;
- Other government agencies, such as the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Animal and Plant Health Inspection Service (APHIS) Wildlife Services, United States Army Corps of Engineers (USACE), USDA Forest Service (USFS); United States Department of the Interior (USDOI) National Parks Service, and the South Carolina Forestry Commission;
- Universities, research institutions, and nonprofit groups with appropriate expertise such as The Nature Conservancy (TNC);
- South Carolina Department of Health and Environmental Control (SCDHEC) and SCDHEC Office of Ocean and Coastal Resource Management (OCRM).

Technical assistance from within DON will be provided by:

- MCRD Parris Island's natural resources personnel;
- Foresters, fish and wildlife biologists, and soil conservationists at Naval Facilities Engineering Command Southeast and MIDLANT (NAVFAC SE and NAVFAC MIDLANT); and
- Additional staff, as needed and subject to funding, to be hired by MCRD Parris Island in order to complete the continuous work for successful implementation of the INRMP.

1.4.5 Labor Resources

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

- Scout troops;

- Elementary, middle, or high school students;
- College students;
- Ecology clubs and conservation programs/groups (*e.g.,* the Student Conservation Association, South Carolina Master Naturalists, Master Gardeners, Master Wildlifers and Master Tree Farmers);
- Businesses/Homeowners' associations;
- Retired military; and
- General Public.

Options for supplemental labor resources from within the Depot include volunteer civilian and military personnel, and their dependents.

1.5 APPROVAL, FUNCTION, USE, AND REVISION PROCESS OF THE INRMP

1.5.1 Approval of the INRMP

The INRMP is required to be signature-endorsed by the subject Depot's Commanding General. According to the SAIA, the INRMP must reflect mutual agreement with the USFWS and the SCDNR. Mutual agreement will concern conservation, protection, and management of fish and wildlife resources, and will be represented by the signing of the appropriate agency representatives or by letter of endorsement.

1.5.2 Function and Use of the INRMP

The INRMP will outline the management of the Depot's natural resources for the next five years. To accomplish this, the INRMP presents long-term management concepts that are consistent with the management of natural resources and fulfillment of the Depot's military mission. While specific projects and schedules are provided for some aspects of this plan, other projects and schedules will be determined as management continues. The plan will be utilized as a guide rather than a cookbook understanding that the plan is part of the adaptive management process which utilizes monitoring information to adjust management to the current situation.

1.5.3 Revision Process

In accordance with the Marine Corps Handbook for Preparing, Revising, and Implementing Integrated Natural Resources Management Plans, this INRMP will be reviewed on a yearly basis and re-approved every five years. The review process will take into account changes in military mission requirements and legal mandates, and information obtained from monitoring programs and surveys. Revisions will be reviewed for consistency with the military mission, federal and state laws, and the ecosystem management goals and objectives of the INRMP.

The revision process will be conducted under the direction of the Depot Commanding General. Substantive revisions will require consultation with, and approval by, the Commanding General, the USFWS, and the SCDNR.

1.6 NECESSARY ELEMENTS OF THE INRMP ADDRESSED

1.6.1 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (MSFCMA) requires the National Marine Fisheries Service (NMFS), the regional fishery management councils, and the Secretary of Commerce to describe and identify essential fish habitat (EFH) for important marine and anadromous fish habitat for species under federal Fishery Management Plans. EFH includes all waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity and extends from offshore habitats to inland areas to where the salt-water influence subsides. EFH includes all types of aquatic habitat, such as wetlands, coral reefs, sand, seagrasses, and rivers (National Oceanic and Atmospheric Administration [NOAA] 2020).

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

1.6.2 Coral Reefs

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

1.6.3 Clean Water Act Action Plan

The United States Environmental Protection Agency (EPA) CWA Action Plan outlines how EPA is strengthening the way it addresses the biggest water pollution challenges. The goals of the plan are to:

- Target enforcement to the most significant water pollution problems,
- Improve transparency and accountability by providing the public with access to better data on the water quality in the communities, and
- Strengthen enforcement performance at the state and federal levels.

EPA's main implementation priority for the plan has been to revamp the National Pollutant Discharge Elimination System (NPDES) permitting, compliance, and enforcement program (EPA 2011). Implementation of this INRMP will not adversely affect water quality, but will be expected to protect and enhance water quality on and in areas surrounding the MCRD Parris Island property.

1.6.4 Critical Habitat

16 USC Section 1532 (5)(A) of the ESA defines critical habitat for threatened or endangered species. Critical habitat is defined as a specific geographic area that is essential for the conservation of

a threatened or endangered species and that may require special management and protection. There are no areas currently designated as critical habitat for threatened or endangered species on MCRD Parris Island.

1.6.5 Public Access

In general, public access is restricted for security and safety. Limited access for hunting and special events is authorized by Depot instructions when appropriate.

1.6.6 Cultural Resources

This plan is written to comply with the National Historic Preservation Act (NHPA) and the Native American Graves Protection and Repatriation Act (NAGPRA) primarily by compliance with the Depot's Integrated Cultural Resources Management Plan (ICRMP) and its guiding laws. Elements of that plan which bear mention here include cultural resources training for Natural Resources personnel, an inadvertent discovery plan, and consultations with recognized Native American Tribes regarding sacred sites, traditional cultural sites, and other items of mutual interest to the Tribes and the Marine Corps.

2.0 HISTORY AND RELATED PLANS

2.1 LOCATION, SETTING, HISTORY, AND MILITARY MISSION

MCRD Parris Island is located in Beaufort County, South Carolina, approximately 50 miles south-southwest of Charleston, South Carolina and approximately 40 miles northeast of Savannah, Georgia (Figure 1). More specifically, the Depot is located at the confluence of the Broad and Beaufort Rivers about 6 miles south of downtown Beaufort, South Carolina.

Beaufort County's population was estimated at 192,122 in 2019 (United States Census Bureau [U.S. Census] 2020). This was a 18.4% increase since the 2010 census population of 162,233 and a 58.9% increase since 2000. The City of Beaufort has a population of 13,436 people in 2019 (U.S. Census 2020). While once primarily rural, residential and commercial development in Beaufort County has changed the character of much of southern Beaufort County.

The MCRD Parris Island operates the facilities that provide a home and a base of operations for recruit training units. The Depot covers approximately 8,270 acres (Figure 2) of which approximately 3,230 acres are dry land and the remaining 5,040 acres are wetlands, tidal marsh and creeks. Land access is currently by a single two-lane causeway.

The Marines first came to Parris Island in 1891; however, the small recruit Depot was closed in 1911. In 1912 the Marines returned to the Island, and it has been used for recruit training since that time. The mission of MCRD Parris Island is to recruit, train, and support the making of basic U.S. Marines for successful follow-on training and service in the Marine Corps. The secondary mission is to provide schools to train enlisted Marines as drill instructors and field staff, to conduct other schools as directed, to provide training in human relations as directed, to conduct rifle marksmanship training for Marine officers and enlisted personnel in the southeastern United States and for personnel of other services as requested, and to conduct training for Marine Reserves as directed.

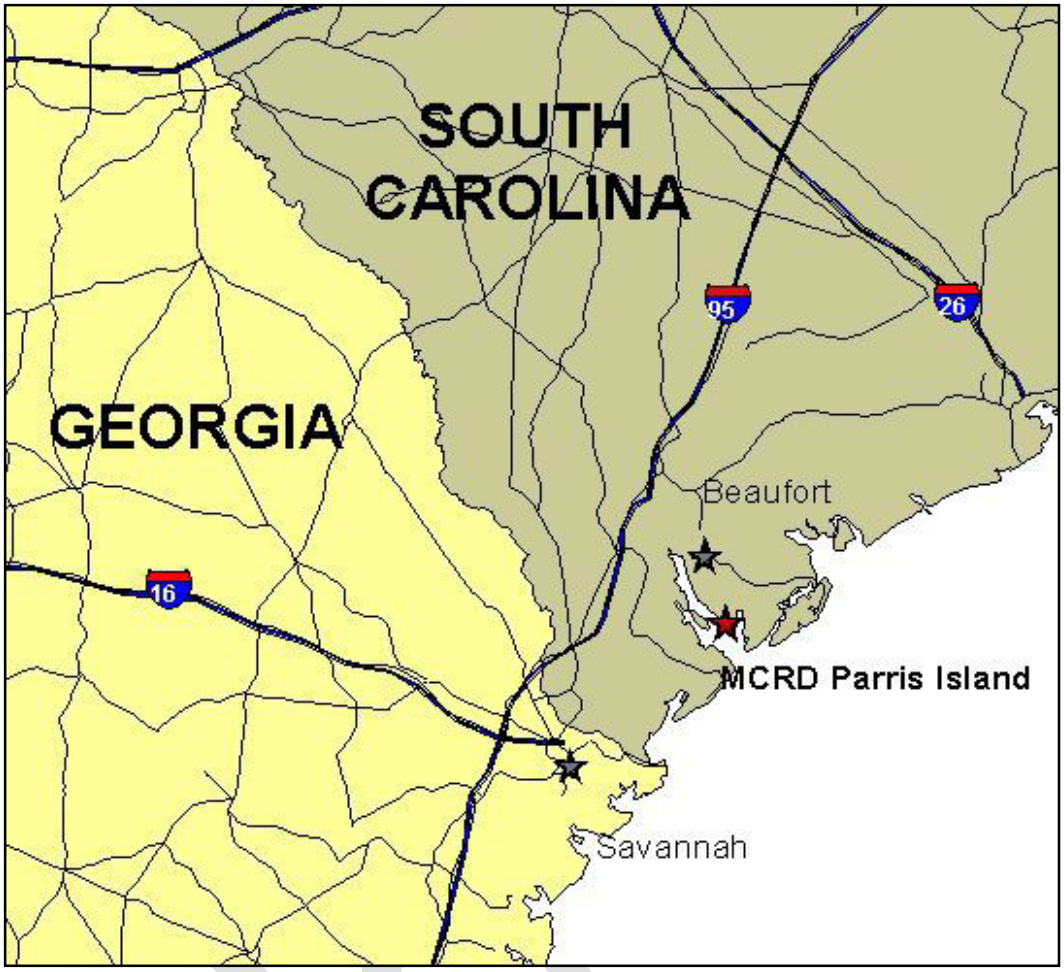


Figure 1. Vicinity Map for MCRD Parris Island, SC

The guiding principles are:

- We are dedicated to the Core Values of Honor, Courage, and Commitment.
- We will accomplish our mission while adhering to our moral principles of honesty, integrity, and ethical conduct.
- We are committed to the safety, health, security, development, and care of marine personnel and their families.
- We are defined by our heritage, traditions, and desire to serve our country.
- We encourage positive relationships with our local communities.
- We will align our individual efforts to contribute to the success of the organization.
- We are good stewards of the environments.

The main units at MCRD Parris Island include the Recruit Training Regiment, the Weapons and Field Training Battalion, and the Headquarters and Service Battalion. Other units and tenants include the 6th Marine Corps District, the Naval Medical Branch Clinic (BUMED), the Naval Dental Center, the Defense Reutilization and Marketing Office, the Navy Criminal Investigative Service), the Naval Federal Credit Union, the Fort Sill National Bank, and the United States Postal Service.

The Recruit Training Regiment implements the standards established by the Commandant of the Marine Corps to train, teach, mentor, and above all lead recruits through a demanding standard-based training system. The Regiment is comprised of the four training battalions, the Support Battalion, and the Drill Instructors School.

The Weapons and Field Training Battalion teaches Entry Level Marksmanship Training, Basic Warrior Training, and also conducts The Crucible in support of the Recruit Training Regiment. The weapons training unit consists of eight live-fire ranges and training areas. Each range is supervised by especially trained Marine marksman who have completed a demanding course of instruction to provide the highest level weapons training in the world. The Weapons and Field Training Battalion provides a safe venue in which recruits receive formal instruction and the skills necessary to maintain and accurately fire the M16A2 Service Rifle and other individual weapons. Field Training teaches recruits the fundamentals of living in the field and surviving on the modern battlefield, which includes chemical, nuclear, radiological, and biological defense.

The Headquarters and Service Battalion is comprised of two companies: Headquarters Company and Service Company. The companies and their respective sections provide critical support to recruit training ranging from clothing supply and gear issue to making liaison with the community and the families of newly graduated Marines. In addition to providing these crucial services and support to the recruits and their families, the Battalion must also maintain the high standards of personal readiness that is required of all Marines. Headquarters and Service Battalion provides continuous administrative and logistical support to the Recruit Training Regiment and Weapons and Field Training Battalion in order to continue "Making Marines."

Parris Island is also home to the headquarters of the Marines' Eastern Recruiting Region and the Sixth Recruiting District.

Figure 2. Overview Map of MCRD Parris Island

The four training battalions, the Drill Instructors School and the Weapons and Field Training Battalion interact the most with the Natural Resources Program through the use of managed lands.

2.2 OVERVIEW OF NATURAL RESOURCES MANAGEMENT

The MCRD Parris Island had a tripartite fish and wildlife cooperative agreement with the SCDNR and USFWS as early as 1963. Subsequent agreements were executed in 1974 and 1978 with an independent agreement between the Depot and SCDNR covering intertidal shellfish also executed in 1978. This agreement allows both commercial and recreational harvests of shellfish by the general public on designated portions of the Depot. Hunting was allowed prior to 1978 with harvest of rabbit, quail, dove, and raccoon recorded as late as 1974. Recreational hunting was prohibited in 1977, but deer hunting has been allowed on a limited basis since 1996. Deer, which were extirpated from the Depot in the past, are believed to have re-colonized the Island in about 1975 and occupy all habitats on the Depot. The earliest planted pine stands on the Depot were also established in the 1960s. Since that time, the Depot has been managed more or less continuously under various long-range management plans. Artificial nest structures for birds were installed in the mid-1980's and have been maintained and added to since that time. Osprey *(Pandion haliaetus),* purple martin (*Progne subis)*, and eastern bluebird (*Sialia sialis)* structures have been erected, but only osprey nesting platforms and bluebird nest boxes exist currently.

The most recent natural resources plan was produced in 2008 for the period 2008 through 2018; this document reformats that plan and extends management from 2022 through 2027. Typical management actions have included forest management (including forest harvest, site preparation, planting, thinning, insect control, etc.); wildlife management (including hunting, habitat enhancement, various biological surveys and rare and endangered species surveys); and outdoor recreation management (including construction of observation platforms, nature trails). The existing conditions of various resources are further described below.

2.3 STAKEHOLDERS AND PARTNERSHIPS

Stakeholders are those organizations or individuals who have a vested interest in land management on the Depot. MCRD Parris Island recognizes that it is important to participate with the surrounding community and to maintain communication between the Depot and the community. In addition, these efforts complement the overall philosophy of actively partnering with and sharing information and resources with other resource management agencies and organizations, including federal, state, or local government agencies, and non-governmental organizations.

Management of natural resources on MCRD Parris Island will be conducted in cooperation with the USFWS, the SCDNR, the USDA NRCS, the USFS, the USACE, the EPA, Native American Tribes, and private individuals and groups interested in the Depot's natural resources. In accordance with the SAIA, the SCDNR and USFWS will approve portions of the plan for which they have statutory authority. The Depot already has a long history of cooperation with these two agencies including a Cooperative Agreement for Conservation and Development of Fish and Wildlife Resources on the Depot. During the next 10 years, cooperation will continue and new partnerships may be forged as opportunities permit.

A number of defense organizations, federal agencies, and state agencies have an interest or a role in the management of the natural resources at MCRD Parris Island. The involvement of these agencies is based on signatory responsibilities, cooperative agreements, regulatory authority, and

technical assistance as required by federal and state laws and regulations. The agencies and their roles are as follows:

- The **NAVFAC SE and NAVFAC MIDLANT** are the major commands assisting MCRD Parris Island in developing and implementing conservation programs.

- The **USFWS** provides signatory agreement concerning the conservation, protection, and management of the fish and wildlife resources presented in the INRMP. USFWS is the principal federal agency for issues regarding fish and wildlife management, as well as the regulatory authority for the ESA of 1973 and the MBTA (16 USC 703 et. Seq.).

- The **NOAA-NMFS**

- The **SCDNR** provides signatory agreement concerning the conservation, protection, and management of the fish and wildlife resources presented in the INRMP. SCDNR is the primary state agency in South Carolina for issues regarding fish and wildlife management and state-listed threatened and endangered species, as well as the regulatory and enforcement authority for hunting, fishing, and trapping. SCDNR is also a consulting agency under the Fish and Wildlife Coordination Act (16 USC 2901 et seq.).

- The **USDA NRCS** works in cooperation with MCRD Parris Island to protect and enhance Depot lands by preventing soil erosion, restoring eroded areas, maintaining vegetative cover, protecting watersheds, providing pest management and wildlife habitat management, and reducing downstream impacts both on and off military lands.

- The **USFS** provides technical assistance for control and prevention of forest insect and disease outbreaks.

- The **EPA** provides limited assistance on wetland delineations and regarding federally listed threatened and endangered species.

- The **USACE** provides technical assistance and permitting for flood control, water management, navigation, wetlands, and shoreline protection issues, as well as regulatory authority for jurisdictional wetlands and waters of the United States.

- The **SCDHEC** provides regulation and protection by the state for South Carolina's waters and other environmental concerns.

2.4 PLANS, PROGRAMS, AND STUDIES

This section addresses existing plans and programs developed for MCRD Parris Island outside the natural resources program. 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.

2.4.1 Stormwater Plan

The CWA of 1977, as amended, establishes regulation of stormwater discharges. Stormwater discharges from a point source are subject to NPDES permitting if the discharges are associated with industrial activity or are specifically identified as contributing to a violation of water quality standards. EPA and state stormwater discharge permit regulations require a NPDES permittee to prepare and implement a Stormwater Pollution and Prevention Plan (SWPPP). This INRMP is consistent with MCRD Parris Island's SWPPP.

2.4.2 Pollution Prevention Plan

MCRD Parris Island has developed a pollution prevention (P2) program to eliminate or reduce the use of unnecessary or environmentally unsound materials or processes in facility operations. The P2 Plan has been prepared to help the Depot manage its pollution prevention program, particularly in the area of hazardous materials. The P2 Plan presents the Depot's pollution prevention goals, describes current work Depot activities or shop processes, summarizes information on hazardous materials usage and hazardous waste generation, incorporates guidance on plan management and administration, and outlines a P2 participation program for all base personnel. The P2 Plan is reviewed and updated every 3 years.

2.4.3 Hazardous Waste

MCRD Parris Island has a Hazardous Waste Management Plan in accordance with MCO 5090.2, Volume 9 and is a large quantity generator of hazardous waste. The Hazardous Waste Management Plan for MCRD Parris Island identifies responsibilities, requirements, and procedures for proper identification, labeling, storage, and management of hazardous waste in compliance with State of South Carolina and EPA laws and regulations. The requirements of the plan apply to all departments, tenants, and contractors performing operations on the Depot that generate hazardous waste.

2.4.4 Land Use and Development Plan

The MCRD Parris Island Master Plan for Land Use and Development (Master Plan) provides a framework for orderly development of the Depot. This plan essentially consists of a four-phased analysis. First, existing land use conditions and environmental and man-made constraints to development are identified, described, and mapped. Second, each constraint is weighed based on the type of limitation it may pose on potential development, then like categories are compiled. The results are then compared against existing development to identify areas of preferred, high, limited, and restricted development potential. Third, proposed projects affecting future land use are identified, described, and mapped. Fourth, an ultimate development vision for the planning horizon of the plan (seven years) is provided. Incompatible land uses are identified and recommendations are made for the resolution of those incompatibilities.

2.4.5 Pest Management

The Public Works Division provides pest control support for MCRD Parris Island through implementation of its Integrated Pest Management Plan (IPMP)(MCO 5090.2, Volume 14). The IPMP outlines the following pest control support:

- Prolonging the life of the all structures through subterranean termite control;

- Maintaining the safety/security of industrial/storage areas, ammunition storage areas and infrastructure through weed control;

- Providing nuisance pest control to all buildings and other areas to insure a good working and living environment;

- Controlling weed and insect pests in all recreational and lawn areas to maintain aesthetics and provide recreational facilities to personnel;

- Providing control of mosquitoes, midges, flies and other potential disease vectors to ensure the comfort and well-being of all personnel;

- Providing vertebrate pest control, including rodent control, to all areas of the base.

Pest management typically is not a natural resources program; however, natural resources management is linked to pest management. Pesticides used in the IPMP may have an impact on natural resources -- specifically on wetlands, water quality, and pollinators. The improper use of pesticides can lead to serious damage to both plant and animal life. Therefore, type and quantity of pesticides used in the IPMP are limited to ensure minimal negative impacts to natural resources. In 2018, the USFWS added an addendum to its 2015 Guidelines for Coordination on INRMPs that provides guidance for addressing pollinators in INRMPs (USFWS 2018). According to the guidance, improper pesticide use can harm pollinators. IPM helps promote pollinators by eliminating and reducing unnecessary pesticide use.

To avoid damage to natural resources, pesticide applications in the vicinity of natural resources areas (*e.g.,* urban forest areas, wetlands) will be consistent with this INRMP and approved by the NRM. Pesticide use is controlled by MCO 5090.2, Volume 14. Common pesticides used include glyphosate for brush control along roads or in rights-of-way and acephate and hydromethylnon for control of fire ants and other arthropod pests. Herbicides, especially glyphosate, will also be used to control invasive plants under this plan and the Depot IPMP.

2.4.6 Grounds Maintenance Program

Grounds maintenance is provided by the Public Works Division via grounds maintenance staff and contracts to private companies.

2.4.7 Integrated Cultural Resources Management Plan

MCRD Parris Island's ICRMP was completed in 2021. The State Historic Preservation Office (SHPO) has approved the plan. The ICRMP addresses a variety of cultural resources issues, but it interfaces with this INRMP primarily in how the natural resources management addresses ground disturbing activities, vegetation management and other activities that may impact cultural resources and in how natural resources personnel consult with Native Americans when issues of mutual concern and interest occur. Work completed under this INRMP will comply with commitments and methods prescribed in the ICRMP, with a programmatic agreement between the Depot, the SHPO and the Advisory Council on Historic Preservation. Work completed under this INRMP will also comply with several existing and planned Memoranda of Agreement between the Depot and specific Native

American Tribes. These memoranda, agreements, and plans are all designed to ensure the Depot complies with the NHPA and the NAGPRA while complying with the natural resources laws that require this plan.

3.0 EXISTING ENVIRONMENT

3.1 MILITARY USE AND TRAINING AREAS

The ranges and their safety zones (Figure 3) are used for marksmanship training. These areas receive use nearly every day of the year by the Weapons and Field Training Battalion to train recruits from the Recruit Training Regiment and are not available for recreational use except when not in use. The presence of spent munitions in the woods within the range safety zones prevents timber harvests and creates (or will create) de facto old-growth timber in these areas. Ammo Supply Point (Figure 4) is used to store various munitions by the Weapons and Field Training Battalion. Access here is very limited in order to maintain safety and security; consequently, recreational use and forest stand harvest are both affected. Recreational use is essentially eliminated and timber harvest is greatly restricted by gates and security requirements. Page Field (Figure 2) is used by both the Recruit Training Regiment and the Weapons and Field Training Battalion for training. The area has forest stands, wetlands, and wildlife interspersed with various training facilities including trails, buildings, courses, and other structures. This area can handle more management and use than the previous lands; however, the training impacts all natural resources management. Conversely, natural resources management in this area will be tailored to suit the training needs of the Depot by frequent communication between the Natural Resources Branch and the two commands utilizing the area.

Figure 3. Range Surface Danger Zones at MCRD Parris Island

Figure 4. Ammunition Storage Area at MCRD Parris Island

3.2 WEATHER AND CLIMATE

3.2.1 Weather

Weather conditions at MCRD Parris Island are influenced by several different patterns during the year. Generally, weather conditions are mild, average temperatures are around 70 degrees Fahrenheit (ºF), and humidity ranges between 70 and 80 percent. The coldest month of the year is typically January, while the warmest months are July and August. Table 3 summarizes the average temperatures and rainfall in the Beaufort area. Hurricane season runs from June through November; while rare, major hurricanes do occasionally strike the southern South Carolina Coast.

Table 3.
Monthly Climate Lows, Highs and Averages for Beaufort, South Carolina

Month	Average High	Average Low	Mean	Average Precipitation
January	58°F	39°F	49°F	4.09 in
February	61°F	40°F	51°F	3.07 in
March	68°F	47°F	58°F	3.70 in
April	75°F	54°F	65°F	2.95 in
May	82°F	64°F	73°F	3.07 in
June	87°F	70°F	79°F	5.75 in
July	91°F	74°F	83°F	5.67 in
August	89°F	73°F	81°F	6.57 in
September	85°F	69°F	77°F	5.06 in
October	77°F	57°F	67°F	3.12 in
November	69°F	49°F	59°F	2.47 in
December	61°F	42°F	51°F	3.26 in

Source: http//.www.weather.com

3.2.2 Climate Change Vulnerability

Climate change refers to "any significant change in climate (such as temperature, precipitation, or wind) lasting for decades or longer" (U.S. EPA [USEPA], 2009). According to the U.S. Global Change Research Program (USGCRP), warming of the climate is both "unequivocal" in its occurrence and primarily human-induced (USGCRP 2018). Across the U.S., there is evidence that

the sea level is rising, hurricane intensities are increasing, average temperatures are rising, and precipitation is occurring more frequently during heavy, single-day events (USEPA 2009). These primary effects of climate change are causing impacts on natural resources such as shifts in species' ranges and distributions, changes in phenology, and variations in ecological processes such as drought, fire, and flood (DODI 4715.03). DODI 4715.03 requires climate change to be addressed in INRMPs to help mitigate potential impacts of climate change on the natural resources on installations. Guidance and climate change information for MCRD Parris Island is summarized below.

The Federal Emergency Management Agency (FEMA) Flood Map Service Center identifies special flood hazard areas of coastal and riverine areas of the U.S. in support of the National Flood Insurance Program. FEMA uses a two-dimensional model and statistical procedures to consider storm surge history and synthetic storms to identify flood zones. The FEMA model identifies 100-year and 500-year floodplains as the standard used by Federal agencies for floodplain management. As discussed in Section 3.7.3 below, areas predicted to be subject to a 100-year flood event on MCRD Parris Island include most of the Depot (FEMA 2020).

Mean annual temperature has increased by almost 1 °F since the beginning of the 20th century (NOAA National Centers for Environmental Information [NCEI], 2019). Under a higher emissions scenario, historically unprecedented warming is projected by the end of the 21st century. Hurricane-associated storm intensity and rainfall rates are projected to increase as the climate warms. A large portion of SC's coastline is vulnerable to projected sea-level rise due to its low elevation and subsidence of land characteristic of being located in the northern part of the Coastal Plain. By the end of the 21st century, global sea level is projected to rise 1–8 feet, with a likely range of 1–4 feet (NOAA NCEI 2019).

In 2018, the USGCRP released its *Fourth National Climate Assessment* (USGCRP 2018), which was written under the authority of the Federal Advisory Committee Act. The report identified several trends and projected impacts related to climate change throughout the U.S. as well as within specific regions of the country. In the southeastern U.S., the coastal plain and inland low-lying regions support a growing population, a tourism economy, and important cultural resources that are vulnerable to climate change impacts. The combined effects of changing extreme rainfall events and sea-level rise are already increasing flood frequencies, which impacts property values and infrastructure viability, particularly in coastal cities. Without significant adaptation measures, these regions are projected to experience daily high tide flooding by the end of the century.

In its 2013 report, *Climate Change Impacts to Natural Resources in South Carolina*, SCDNR identifies the overriding natural resource issues related to climate change and provides recommended actions for conserving natural resources in South Carolina during an era of changing climate. According to that report, some of the impacts South Carolina faces include a projected average temperature rise of as much as 9 ºF over the next 70 years, increased flooding on beaches and marshes, and salt-water intrusion into coastal rivers and freshwater aquifers that is likely to kill off or deplete some species of fish and potentially affect drinking-water supplies. According to the report, the state also faces the likelihood of more "dead zones" in the ocean off the coast with potentially perilous effects on the State's population of loggerhead sea turtles. General goals identified by SCDNR "in order to move forward in an era of climate change while protecting natural resources" include, among others, spatial mapping, monitoring and establishing living and non-living resources and climate trends, adaptation strategies, integration

and analysis of data, outreach and education, and developing additional partnerships and collaborating with others.

3.3 AIR QUALITY

The MCRD Parris Island is located in Beaufort County South Carolina, which is classified as an attainment area (meets all National Ambient Air Quality Standards [NAAQS]) (EPA 2020). Because the region is in attainment for all NAAQS, this plan is not subject to the General Conformity Rule of the Clean Air Act.

The only emissions sources resulting from the natural resources management program are prescribed fire, wildfires, and motor vehicles. The vehicles operated by the natural resources program and the vehicles operated by resource users are minor mobile sources. The major potential for air quality impacts comes from woods fires, both prescribed and wild. The greatest air quality concerns from woods fires are particulate matter and carbon monoxide. Since prescribed fires are only set under predetermined conditions that have been chosen to reduce the drift of smoke across occupied land, prescribed fires generally produce less air quality problems than wild fires. These same conditions also reduce safety concerns associated with smoke drifting across roads and obstructing visibility.

All prescribed fires at MCRD Parris Island have been set in accordance with guidance established by the state forestry commission to alleviate both air quality and safety concerns.

Prescribed fires at MCRD Parris Island burn approximately 300 acres per year, on a 2-to-3-year rotation. The last prescribed fire was done in 2020/2021. The most recent wildfire burned several acres on a Page Field training area in 2021.

3.4 COASTAL RESOURCES

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S. Code [USC] 1451 *et seq*.), as amended, encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. Under the CZMA, the Marine Corps is obligated to ensure that any of its activities that would take place in the state coastal zone or affect state coastal resources are carried out in a manner consistent with approved coastal zone management programs, or in some instances, consistent to the maximum extent practicable.

South Carolina has adopted a Coastal Zone Management Program (CZMP). The Secretary of the United States Department of Commerce approved South Carolina's CZMP under the CZMA. This INRMP is consistent with South Carolina's CZMP.

3.5 PHYSIOGRAPHY, GEOLOGY AND TOPOGRAPHY

Beaufort County is generally low and gently sloping to flat with a series of ancient marine terraces. Elevations within the county range from sea level to approximately 100 feet above sea level in the northwestern corner of the county. Over 50 percent of the area has elevations of less than 42 feet (characterized by reviewing satellite imagery).

3.5.1 Geology

MCRD Parris Island is located in the Coastal Plain physiographic province and is part of the Sea Island section. The Coastal Plain consists of a flat, broad plain underlain by a series of unconsolidated to semi consolidated sedimentary formations followed by basement rock (continental crust). These basement rocks are composed of granite, gneiss, schist, and diabasic (intrusive igneous) rocks. In the MCRD Parris Island area, the basement rocks occur at depths more than 3,400 feet below mean sea level (U.S. Geological Survey (USGS) 1956).

Overlying the basement rocks are the Coastal Plain formations consisting of gravel, sand, clay, limestone, marl, and shale. These layers were deposited by marine or fluvial action during cycles of retreating ocean shoreline. In ascending order, they represent deposits of Late Cretaceous, Tertiary, and Pleistocene to recent age. These layers strike in a northeast-southwest direction and dip to the south along with the basement rock (USGS 1956).

3.5.2 Topography

The MCRD Parris Island is located between the Broad and Beaufort Rivers in Beaufort County, which lies in Southeast South Carolina. Land elevations on MCRD Parris Island range from sea level to 22 feet above sea level. About half of the Depot is tidal salt marsh and inundated twice daily.

3.6 SOILS, CROPLAND AND DEVELOPED AREAS

3.6.1 Soils

The USDA NRCS has mapped 15 soil types at MCRD Parris Island (Figure 5). These soils can be categorized into three general soil classifications. The Bohicket-Capers-Handsboro soils, covering about 50% of the Depot, are very poorly drained mineral and organic soils that are flooded daily or occasionally by salt water. These soils support the tidal marsh that is so important to the local fisheries. The Coosaw-Williman-Ridgeland somewhat poorly drained and poorly drained soils cover about 35% of the Depot. These sandy soils provide the most developable areas of the Depot. The Wando-Seabrook- Seewee soils, covering 15% of the Depot, are sandy throughout and excessively well drained to poorly drained. These soils are generally well suited for development, but their location on the Depot (down range from the rifle range) makes them unsuitable for development. The presence of soils with seasonal high water table affects the types of wildlife as well as the quality of habitat for wildlife present. Wetland areas provide needed sources of water for wildlife, but the only permanent sources of fresh water on the Depot are man-made ponds scattered about the golf course. The seasonal high water table affects the type of trees that will grow, as well as the productivity of selected types of trees. Poorly drained soils are suitable for agriculture only through artificial drainage. Poorly drained soils affect the type and intensity of recreational activities possible. The seasonal high water table associated with all the soils on the Depot presents a constraint for agricultural use, building construction, and most land uses requiring heavy equipment. Over the years, significant portions of these soils have been drained by ditches and underground pipes. Drainage for one use, such as agriculture or urban use, alters the physical characteristics of a soil and impacts its capabilities for other uses, such as wildlife.

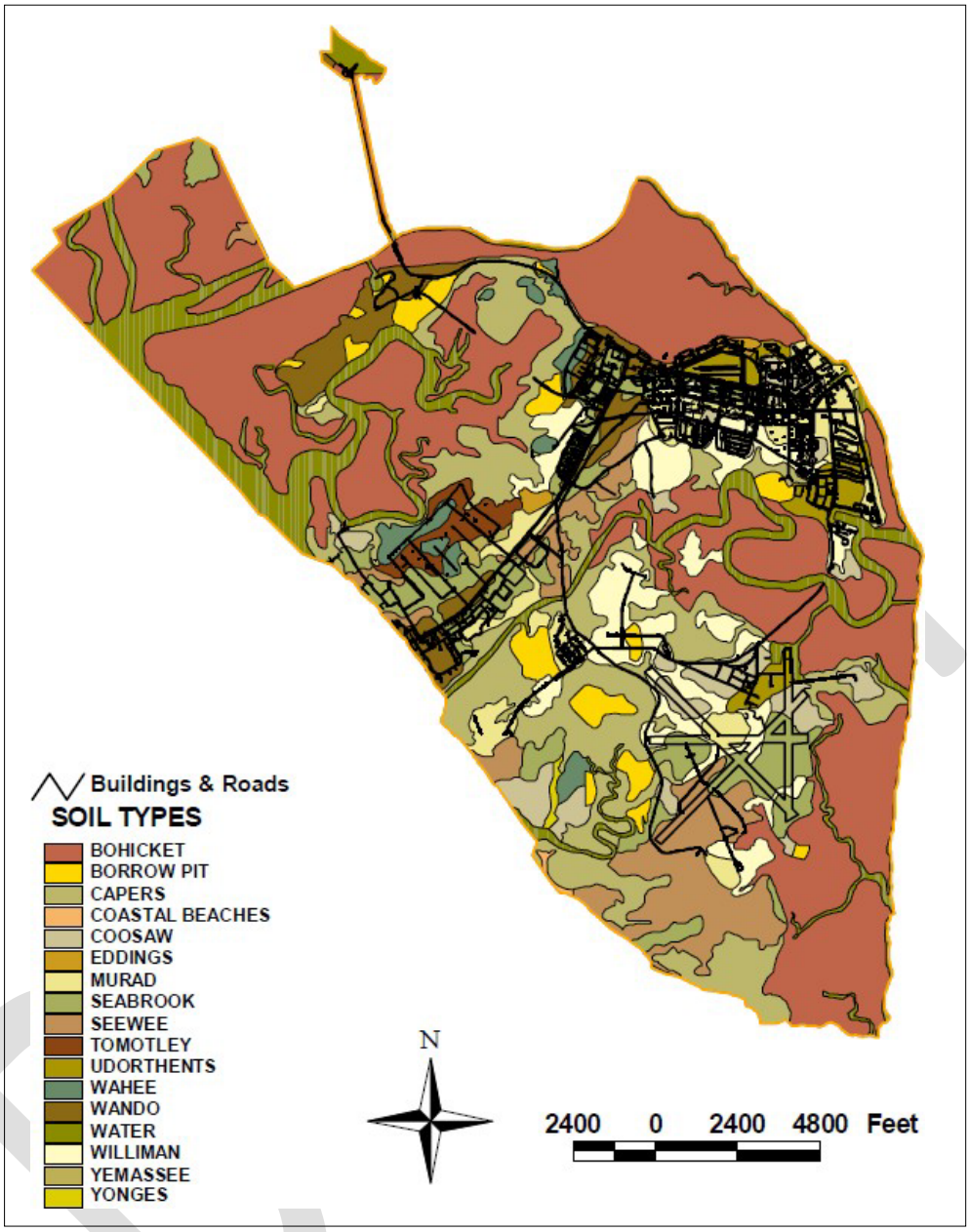


Figure 5. Soil types at MCRD Parris Island, SC

3.6.2 Maintained Areas

The maintained areas consist primarily of the training and urban/ production areas. Training is conducted almost every day of the year. The developed areas contain administrative buildings, facility maintenance structures, training structures, training fields, other operational structures, and personnel housing. These areas primarily are located on soils with the least natural limitations for construction.

Though most of the land in the urban area is developed, there are still small parcels that remain as open land, wetland areas, or urban forest patches. Other than the buildings and

transportation infrastructure, the urban area is covered with manicured lawn grasses and landscaping materials such as shrubbery and trees. A grounds maintenance program for the urban area provides for regular mowing of the grass and pruning of shrubbery. The primary natural resources management issues for the developed area are wildlife habitat conservation, wetlands/water quality protection, urban forestry, grounds maintenance, and integrated pest management. Approximately 1,578 acres of the Depot are maintained as improved and semi-improved acreage. Recent executive orders and memoranda have directed federal agencies to reduce the use of exotic plantings, irrigation, and pesticides for maintenance of developed landscapes, these directives will be implemented.

Pesticide use is covered under a separate pest management plan not covered in this document and is controlled by MCO 5090.2, Volume 14. Common pesticides used include glyphosate for brush control along roads or in rights-of-way, bromacil for control of undesired plants, and acephate and hydromethylnon for control of fire ants and other arthropod pest. There are no agricultural outleases on the Depot and none are planned.

3.7 HYDROLOGY

The Depot is located between the Broad and Beaufort Rivers which flow into Port Royal Sound at the southern tip of the Depot. These lands and waters are in the Broad-St. Helena Watershed (hydrologic unit code [HUC] 03050208). The boundaries of the Depot include portions of three 12-digit HUC sub-watersheds shown in Table 4 below. EPA's Preliminary Healthy Watersheds Assessment characterizes the condition of watersheds at the 12-digit HUC scale, focusing on six key attributes of watershed health: landscape condition, geomorphology, habitat, water quality, hydrology, and biological condition. EPA classifies the watershed health of these three watersheds as about average as compared to HUC 12 watersheds in the state and above average as compared to HUC 12 watersheds in the multi-state ecoregion (EPA 2017).

Table 4.
Health of Watersheds Within or Partially Within MCRD Parris Island

Watershed	12-Digit HUC Code	Health based on Statewide Percentile	Health based on Ecoregional Percentile
Battery Creek	030502080501	43.0%	63.1%
Lower Beaufort River-Atlantic Intracoastal Waterway	030502080503	56.7%	74.8%
Broad River-Port Royal Sound	030502080608	54.6%	73.7%

Source: EPA 2017

No Section 303d listed waters are located on the Depot; however, a sampling station in the Port Royal Sound estuary located 1.8 miles southwest of the coastward tip of Parris Island is listed as impaired due to copper exceedances for supporting its designated use Aquatic Life Support. A

total maximum daily load has not been developed for restoring this impaired water (EPA 2016). The only permanent freshwater on the Depot consists of 11 man-made golf course ponds totaling 27.2 acres. With the exception of these small man-made ponds, all surface freshwater on the Depot is intermittent in nature even though some ponds only go dry during extreme drought.

The Depot has been ditched, which has altered surface hydrology generally by drying out the soils of wetland areas; however, the ditching also provides straighter access for flood tides. There are also many roads that impede surface flow and make areas wetter. Consequently, as with much of the county, the hydrology has been complicated by human activities.

3.7.1 Wetlands

Wetlands are considered transitional zones between the terrestrial and aquatic environments. Physical, chemical, and biological features indicative of hydrological conditions characterize these areas. Wetlands serve as a valuable resource for groundwater recharge within the region and are currently regulated by USACE under Section 404 of the CWA. Wetlands are defined by USACE as "…those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." The MCRD Parris Island contains both:

- Freshwater wetlands – frequently occur along streams in poorly drained depressions and in the shallow water along the boundaries of lakes, ponds and rivers. Freshwater wetlands may stay wet all year long, or the water may evaporate during the dry season; and

- Estuarine wetlands – consist of deep-water tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land (see Figure 6).

A small-excavated pond is located next to the skeet range. This pond holds water most of the year and provides fresh water for wildlife and is used as a loafing area (and possibly a roost area) by night herons, wood storks, and other wading birds. Several small (< 1 acre) ephemeral wetlands are scattered on Page Field, Elliott's Beach and other training and undeveloped areas. There is also a small (~1/8 acre) manmade pond at the south end of Page Field.

Figure 6. Estuarine Wetlands Near High Tide at MCRD Parris Island

A jurisdictional wetland survey was approved by the USACE in 1992; however, MCRD Parris Island contracted to have a new wetland delineation completed for a portion of the Depot expected to be impacted by the "grow the force" initiative and as part of the Environmental Assessment in 2008. The estuarine wetlands are composed predominately of smooth cordgrass (*Spartina [Sporobolus] alterniflora)*. At higher elevations near the islands, the smooth cordgrass becomes progressively less vigorous and small sandy flats and salt meadow areas exist. The predominant vegetation in these areas includes black needlerush (*Juncus roemerianus)*, saltgrass *(Distichlis spicata),* sea oxeye *(Borrichia frutescens)*, and other species, including various bulrushes and sedges. In addition to providing primary productivity and serving as an erosion buffer, these marsh areas also provide habitat for rails *(Rallus sp.,* blackbirds *(Icteridae*), wading birds, raccoon (*Procyon lotor)*, river otter (*Lutra canadensis*), American alligator (*Alligator mississippiensis*), wood stork (*Mycteria americana)*, osprey, and bald eagle (*Haliaeetus leucocephalus*). The creeks and rivers within the marsh and the waters adjacent to the property support a wide diversity of marine and estuarine fishes including flounder (Pleuronectoidei), sheepshead (*Archosargus probatocephalus*), black drum (*Pogonias cromis*), black sea bass (*Centropristis striata*), pin fish (*Lagodon rhomboides*), Atlantic croaker (*Micropogonias undulatus*), spotted sea trout (*Cynoscion nebulosus)*, channel bass (*Sciaenops ocellatus*), whiting (*Menticirrhus* sp.*)*, mullet (Mugilidae), ladyfish (*Elops saurus)*, and immature stages of many other species. The adjacent waters also contain eastern oysters (*Crassostrea virginica*), hard clams (*Mercenaria mercenaria*), shrimp, and blue crabs *(Callinectes sapidus).*

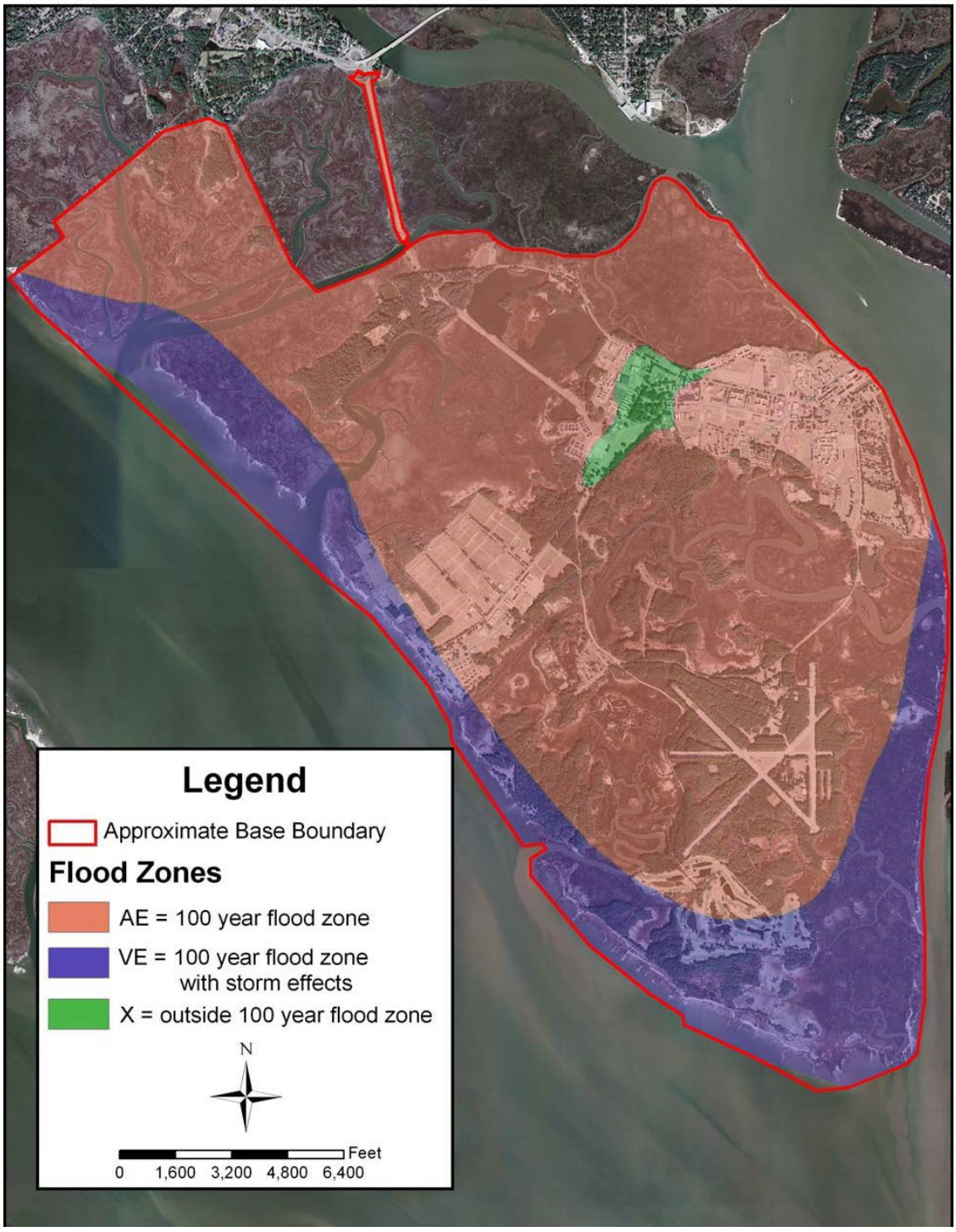
Few freshwater wetlands occur on the Depot. These include small amounts of wet flatwoods with a very few ephemeral ponds. The flatwoods and associated ponds have an overstory of slash (*Pinus elliottii*) or loblolly (*Pinus taeda*) pine, Chinese tallow (*Triadica sebifera*), blackgum (*Nyssa sylvatica*), and/or red maple *(Acer rubrum).* The midstory, when present, consists primarily of smaller individuals of the overstory species. The shrub layer, when present, is dominated by bitter gallberry *(Ilex glabra),* wax myrtle (*Morella cerifera*), and briars. The herbaceous layer is usually absent. These areas provide limited breeding grounds for frogs and toads. Due to the long history of human occupation, most of the wetlands on the Depot have an altered hydrology brought about by drainage, and damming (from roads).

3.7.2 Groundwater

There are two, possibly three aquifers at the Depot. The surficial aquifer is underlain by the Coosawhatchie Formation and some other confining layers before reaching the Floridan Aquifer which extends continuously from South Carolina into Florida. This aquifer is the most important source of groundwater in the lowcountry of South Carolina. Groundwater extraction combined with areas east of the barrier islands where there is no confining layer between the Floridan Aquifer and the salt water has led to saltwater intrusion into the Upper Floridan Aquifer around Hilton Head Island. The possible third aquifer, which is definitely present south along the Georgia coast, is the Brunswick Aquifer which resides between the Surficial and Floridan Aquifers (Payne et al. 2005). There are no sole source aquifers in the state of South Carolina (EPA 2020).

3.7.3 Floodplains

FEMA defines floodplains as areas subject to a one (1) percent or greater chance of flooding in any given year. Floodplains are low, relatively flat areas adjoining inland and coastal waters. Extensive floodplain areas exist in the Beaufort area because of its slight elevation above sea level and the relatively flat topographic relief of the land surface. Areas predicted to be subject to a 100-year flood event on MCRD Parris Island include most of the Depot (FEMA 2020) (Figure 7).



Source: FEMA (2020) Flood Insurance Rate Maps (FIRMs) 4500250095D and 4500250125E

Figure 7. Flood Zones at MCRD Parris Island

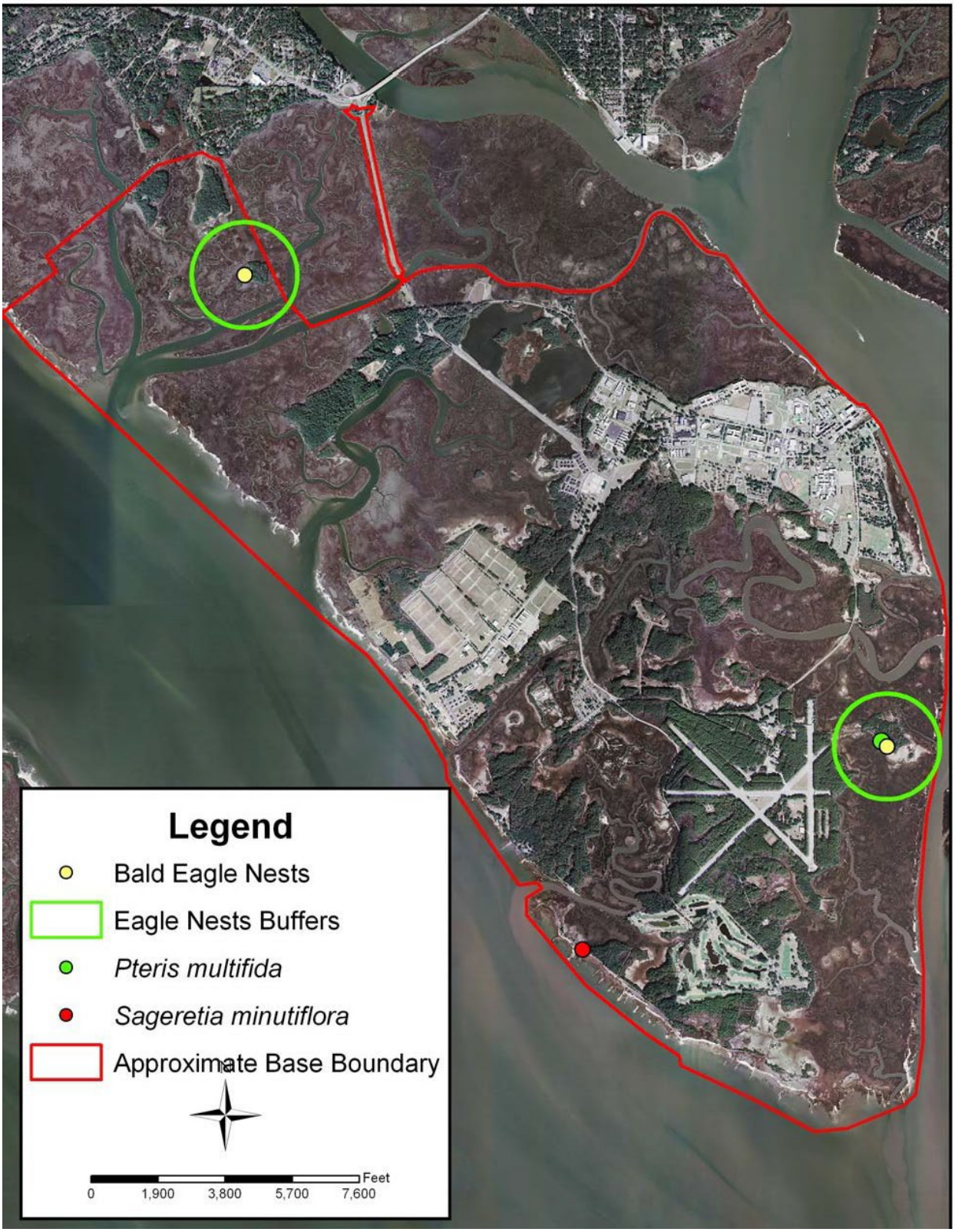


Figure 8. Known Rare Species Locations at MCRD Parris Island, SC

3.8 VEGETATION

All of MCRD Parris Island falls within the Coastal Zone Ecoregion as defined in South Carolina's State Wildlife Action Plan (SCDNR 2015). The Depot can be further divided into the following habitat types: salt marsh, brackish marsh, salt flat, salt shrub thicket, oyster reef, pine forest, maritime forest (maritime live oak forest), shell midden (shell mounds), mud flat/borrow pit, abandoned dike, and developed areas. The first nine of these habitat types have been described by Nelson (1986).

The first four habitat types, while distinct communities, intergrade into each other and all result from the interaction of tides and elevations. All four habitats, described further below, are wetlands and are protected by the Clean Water Act.

3.8.1 Wetland Vegetation

The salt marsh is dominated by and consists almost exclusively of smooth cordgrass, but also often includes salt meadow cordgrass (*Sporobolus pumilus)* and saltgrass. This community is flooded twice daily by tides. While vegetatively simple, the high productivity of this community provides the basis for an extensive marine food chain. This community serves as a nursery ground for shrimp, crabs, and fish and eventually helps sustain the production of most major commercial and recreational maritime fisheries in the area.

The area of tidal marsh known as Third Battalion Pond has been semi-isolated by an old causeway. While it is flushed by tides greater than eight feet, the placement of culverts prevents total exposure and has resulted in an area with high productivity, wildlife use, and recreational use for observing wildlife.

The salt marsh community grades into the brackish marsh, mud flat, sand flat and salt shrub thicket communities. The brackish marsh receives less flooding than the salt marsh, but is flooded more often than the other communities. While brackish marshes frequently consist of almost monocultural stands of black needlerush, around MCRD Parris Island they are often rather diverse with salt meadow cordgrass, sedges (*Scirpus, Eleocharis, Cyperus, Fimbristylis* sp.), saltgrass, seashore dropseed (*Sporobolus virginicus)*, lavender thrift (*Limonium carolinianum)*, perennial saltmarsh aster (*Aster tenuifolius)*, and seaside goldenrod (*Solidago sempervirens)*. This community also supports the marine fishery food chain.

Mud flats are not vegetative communities but do add greatly to the biodiversity of MCRD Parris Island. Mud flats are known for their diversity of bird species -- especially migratory shorebirds. At MCRD Parris Island the extensive mudflats are mostly associated with very old borrow operations.

Salt flats are slightly higher in elevation than the previously noted communities and may be flooded only once daily. The soils are hyper-saline so the vegetation is rather specialized. Virginia glasswort (*Salicornia virginica)* and saltwort (*Batis maritima)* are very characteristic of this community. Saltgrass, annual seepweed (*Suaeda linearis),* lavender thrift, cordgrass (*Sporobolus* sp.), perennial saltmarsh aster, and seashore dropseed also commonly occur. This community type also supports the marine food chain.

The salt shrub thicket is best described as a narrow, bushy area between the lower communities just described and the maritime forest. Common species include baccharis (*Baccharis* sp.), Jesuit's bark (*Iva frutescens)*, sea oxeye daisy (*Borrichia frutescens)*, wax myrtle, cabbage palmetto (*Sabal palmetto)*, gulf coast swallow-wort (*Cynanchum palustre)*, black needlerush, and cordgrass. This community does not contribute to the marine food chain as significantly as those previously mentioned.

In addition to the described wetland habitats above, oyster reefs and clam beds are found inter- and subtidally at MCRD Parris Island. All of these areas were previously mapped as wetlands. While these areas are not rare, they are ecologically significant and, collectively, are the most sensitive and ecologically valuable resource on MCRD Parris Island.

3.8.2 Other Vegetated Habitats

Shell mounds or middens also occur on the Depot. One rare plant, smallflower mock buckthorn (*Sageretia minutiflora)*, has been located on an area of accumulated shells on the Depot (Figure 8). This specimen may no longer exist here due to the 2016/2017 storms that washed away pats of this area. More extensive searches will need to be performed to try and locate any surviving specimens. The calcium supplied by the shells alters soil properties and provides habitat for plants not normally located in the area. Middens may have archaeological as well as ecological value.

Maritime forests make up the next most valuable natural community occurring on MCRD Parris Island. Maritime forests are generally thought of as the forests just inland from the beach dunes habitat and subject to continual salt spray. The stress from the salt reduces the diversity of this community. The maritime forests at MCRD Parris Island are a more inland version of this community. The most inland maritime forest on Horse Island actually has some elements of the southern mixed hardwood forest including pignut hickory (*Carya glabra)*, spruce pine (*Pinus glabra)*, sweetgum (*Liquidambar styraciflua)*, sparkleberry (*Vaccinium arboreum)*, saw palmetto (*Serenoa repens)*, black cherry (*Prunus serotina)*, dwarf palmetto (*Sabal minor)*, and American beautyberry (*Callicarpa americana)*. Other understory species present on Horse Island include wax myrtle, redbay (*Persea borbonia)*, chinquapin (*Castanea pumila)*, Hercules' club (*Zanthoxylum clava-herculis)*, winged sumac (*Rhus copallina)*, juniper (*Juniperus* sp.), devil's walkingstick (*Aralia spinosa),* sand live oak *(Quercus geminata)*, running oak (*Quercus pumila)*, and sassafras (*Sassafras albidum)*. The greater diversity of the more inland maritime forests is typical. The maritime forests on MCRD Parris Island have been disturbed from previous logging, ditching, and development. Note that many of the ecologically classified maritime forest are classified as mixed pine/hardwood stands from a forestry perspective. Also note that many of these lands were farmed for Sea Island cotton at one time.

Another important area is the stand of exceptionally large live oaks and other hardwoods located at the south end of the Depot and adjacent to the golf course (Figures 9 and 10). Until recently, the area under these trees was regularly mowed, but the grass and other plants under the oaks are now growing wild. It is not clear whether these specimens are former plantings around an old residence or are the remnants of a cleared maritime forest. However, it is adjacent to a known old plantation residence.

In 2013 (updated in 2022), the Depot completed a Tree Protection and Preservation Standard Operating Procedure to protect the unique trees and forestlands found on the Depot from

construction activities related to Depot expansion and other Depot development and maintenance activities. Protected trees within a construction site area are identified, marked, and barricaded to prevent any damage during construction or associated activities (i.e., equipment storage, parking cars). The tree barricades should be removed only after all restoration and construction activities are complete to ensure the protected species remain undamaged. In addition, a Champion Tree survey was performed in 2010 to determine if the Depot had any of the state's largest tree species. The Depot recorded 41 significant trees, 12 of which were state Champions or Co-Champions, and three unique stands of trees containing individuals of the largest species of tree on Parris Island. These trees are protected from removal during future harvesting and construction operations, and are surveyed once every five years to make sure they are alive. If the trees are found to be in poor condition, an arborist is consulted to prevent further decline.

Figure 9. A Few of the Large Live Oak Trees at South End of Depot and Near Golf Course

Figure 10. Two Special Habitat Areas at MCRD Parris Island, SC

The southern portion of MCRD Parris Island also has an abundance of old dikes and habitats similar to the maritime scrub thicket and maritime grassland. The extreme tip of the Depot actually has shell "beaches." These habitats are believed to result from the long fetch created by the junction of

the Broad and Beaufort Rivers at Port Royal Sound. Typical species from these habitats include perennial saltmarsh aster, bushy seaside tansy, tough bully *(Bumelia tenax),* sandbur *(Cenchrus* sp.*),* gulf croton *(Croton punctatus),* yaupon *(Ilex vomitoria),* juniper, annual yellow sweetclover *(Melilotus indica),* hairawn muhly *(Muhlenbergia capillaris),* wax myrtle, devil's-tongue (*Opuntia compressa),* bitter panicgrass (*Panicum amarum),* switchgrass (*Panicum virgatum),* live oak (*Quercus virginiana),* cabbage palmetto, saw palmetto, saltmeadow cordgrass, annual seepweed, seaoats *(Uniola paniculata),* Hercules' club, aloe yucca (*Yucca aloifolia),* and moundlily yucca (*Yucca gloriosa).*

The remaining areas of the Depot are either developed or pine and mixed pine/ hardwood stands. The pine stands have relatively high economic value from the production of wood products. The pine stands are either planted or unplanted and either loblolly pine or slash pine and are usually well stocked with over 100 square feet of basal area per acre. Recently thinned stands have lower basal areas of around 70 square feet per acre. The understory is usually sparse, but dominated by wax myrtle, yaupon, and water oak (*Quercus nigra)*. Other common plants include peppervine (*Ampelopsis arborea)*, dogfennel (*Eupatorium capillifolium)*, juniper, Virginia creeper (*Parthenocissus quinquefolia)*, black cherry, blackberry (*Rubus* sp.), Chinese tallow, sassafras, and greenbrier (*Smilax* sp.). In both the planted and "natural" stands, oaks and other hardwoods are abundant enough to classify some of the stands as mixed pine-hardwood. However, this classification does not relate to any natural community except as described above on Horse Island. The developed areas are vegetated with ornamental flowers, shrubs, and trees planted among the lawn grasses and weeds.

Note also that collectively, the Depot is a cluster of hammock islands (see Whitaker et al. 2004) with most of the major islands' uplands developed. Some of the smaller islands, while by no means pristine, continue to support a variety of habitats with the distinctive floral and faunal assemblages of the hammock islands. One of these islands, Doggie, has a near permanent freshwater pond on it.

3.8.3 Invasive Species

Species can be categorized as invasive, exotic, and native, and/or native and invasive. 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). EO 13112, Invasive Species, of February 3, 1999 requires executive agents to prevent the introduction of invasive species into natural ecosystems. Exotic species are defined as all species of plants and animals not naturally occurring, either presently or historically, in any ecosystem of the United States and as non-indigenous (nonnative) species that were either purposefully or accidentally introduced into an area outside its natural range. EO 11987, Exotic Organisms, requires executive agencies to restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration, among other restrictions.

The Federal Noxious Weed Act of 1974 (7 USC. 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 USC. 2802 (c)).

The following invasive, exotic species occur on or near MCRD Parris Island:

- Silktree (*Albizia julibrissin*), a native of Asia, is an ornamental that has escaped and become naturalized in the southeastern United States. It is found mainly along roadsides, disturbed areas, and edges of forests.

- Giant Reed (*Arundo donax*) is a tall, perennial grass that can grow to over 20 feet in height. It becomes established in moist places such as ditches, streams, and riverbanks, growing best in well drained soils where abundant moisture is available.

- Chinese tallow or popcorn tree (*Triadica sebifera*) tends to take over large areas, mainly areas with wet soils, but can thrive in upland areas as well. It can survive in both poorly drained freshwater and saline soils. It has the capacity to dominate wetland areas.

- Chinese privet (*Ligustrum sinense*) generally occurs on open disturbed sites and is difficult to control in wetland areas.

- Chinaberrytree (*Melia azedarach*) generally occurs around old home sites, but expands from there into disturbed areas.

- Common reed (*Phragmites australis*) thrives in shallow water and wet soils. It has spread throughout Gulf and Atlantic Coast marshes in the United States in the past 30 years.

- Saltcedar (*Tamarix* sp.) is a large shrub or small tree that was introduced to North America from the Middle East in the early 1800s. It continues to spread rapidly and currently infests water drainages and wet areas. Saltcedar is most commonly found where it has been planted along roads on the Depot, but is also occurs on other portions of the Depot.

- Misc. aquatic weeds (water hyacinth, *Eichhornia* sp. and *Alternanthera* sp.) can degrade water quality and dramatically alter native plant and animal communities.

- Southern mole crickets (*Scapteriscus borellii*) damage turf and pasture grasses mainly by tunneling (because it is largely carnivorous and feeds on soil-inhabiting insects).

- Fire ants (*Solenopsis* sp.) include many opportunistic ant species, both exotic and native. Fire ants are present throughout MCRD Parris Island.

Additionally, cogongrass (*Imperata cylindrica*), a particularly serious invasive plant, could also be present on the Depot.

An invasive plant survey and management plan was completed in 2001. Chinese tallow (also called popcorn tree) and chinaberry tree were found to be the worst invaders, with saltcedar and Chinese privet also present and in need of control. Problem areas were concentrated around disturbed sites, but also occurred in moist, freshwater soils and along roads where saltcedar was planted. Another invasive plant survey was performed in 2010, again Chinese tallow being the primary target due to its having the highest impact on the Depot. Additional data was collected on its occurrence to better provide an overview of the population dynamics of Chinese tallow on the Depot. Other invasive species documented during the 2010 survey included: mimosa, autumn olive *(Elaeagnus umbellata)*, glossy privet *(Ligustrum lucidum)*, Chinese privet, Japanese honeysuckle *(Lonicera japonica)*, chinaberry tree, golden bamboo *(Phyllostachys aurea)*, and tamarix/saltcedar.

MCRD Parris Island initiated herbicide control treatments in 2002 and has continued treatments since then with good success. Results of the 2010 invasive plant survey indicate that the effective management of invasive species populations must be long-term and prioritized to focus on the largest populations, high-quality habitats, or areas that produce a high number of propagules contributing to the infestation.

3.9 WILDLIFE

3.9.1 General

The Depot's wildlife is typical of South Carolina's outer Coastal Plain. (Lists of vascular plants and vertebrate species encountered at the Depot over the years are provided as Appendix IV. Rare, threatened, and endangered species are discussed below.) The most common large mammal on the Depot is the white-tailed deer (*Odocoileus virginianus)*. Deer are hunted in accordance with state regulations as further restricted to provide for safety and security.

Amphibians found at MCRD Parris Island include southern toad (*Bufo terrestris* or *Anaxyrus terrestris*), eastern narrowmouth toad (*Gastrophryne carolinensis*), and southern leopard frog (*Lithobates sphenocephalus* or *Rana sphenocephala)*. Common reptiles found at MCRD Parris Island include: turtles (Chelonia and Testudines), green anole (*Anolis carolinensis)*, southeastern five-lined skink (*Plestiodon inexpectatus)*, broadhead skink (*Plestiodon laticeps)*, ground skink (*Scincella lateralis)*, eastern glass lizard (*Ophisaurus ventralis*), southern black racer (*Coluber constrictor priapus)*, yellow rat snake (*Pantherophis alleghaniensis)*, and eastern diamondback rattlesnake (*Crotalus adamanteus)*. Common birds found at MCRD Parris Island include: double- crested cormorant (*Phalacrocorax auritus*), herons (Ardeidae), egrets *(Egretta* or *Ardea),* wood stork, bald eagle, osprey, red-tailed hawk (*Buteo jamaicensis)*, northern harrier (*Circus hudsonius)*, American kestrel (*Falco sparverius*), clapper rail (*Rallus crepitans*), bufflehead (*Bucephala albeola*), killdeer (*Charadrius vociferus*), laughing gull (*Leucophaeus atricilla*), ring-billed gull (*Larus delawarensis*), great horned owl (*Bubo virginianus*), mourning dove (*Zenaida macroura*), chimney swift (*Chaetura pelagica*), belted kingfisher (*Megaceryle alcyon*), red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Dryobates pubescens*), northern flicker (*Colaptes auratus*), great-crested flycatcher (*Myiarchus crinitus*), white-eyed vireo (*Vireo griseus*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), fish crow (*Corvus ossifragus*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), brown- headed nuthatch (*Sitta pusilla*), Carolina wren (*Thryothorus ludovicianus*), gray catbird (*Dumetella carolinensis*), European starling (*Sturnus vulgaris*), yellow-rumped warbler (*Setophaga coronata*), painted bunting (*Passerina*

ciris), yellow-throated warbler (*Setophaga dominica*), pine warbler (*Setophaga pinus*), eastern towhee (*Pipilo erythrophthalmus*), white-throated sparrow (*Zonotrichia albicollis*), northern cardinal (*Cardinalis cardinalis)*, red-winged blackbird (*Agelaius phoeniceus)*, and common grackle (*Quiscalus quiscula*). Common mammals found at MCRD Parris Island include moles (Talpidae), evening bat (*Nycticeius humeralis*), eastern gray squirrel (*Sciurus carolinensis*), marsh rice rat (*Oryzomys palustris*), cotton rat (*Sigmodon* sp.), Norway rat (*Rattus norvegicus*), eastern woodrat (*Neotoma floridana floridana)*, raccoon, mink *(Mustela vison*), river otter, and white-tailed deer.

3.9.2 Game Species

The MCRD Parris Island allows harvest of white-tailed deer in accordance with state and federal regulations except where hunting is restricted by Installation instructions. While furbearers (raccoon, opossum, mustelids) are present, trapping is not authorized on the Depot.

White-tailed deer occupy both forest and non-forest habitats. Habitat on the Depot has been enhanced by thinning forest stands and prescribed burns. The varied habitat types available on MCRD Parris Island provide cover and a diverse food supply during all seasons of the year. The sex, weight, and age of harvested deer are recorded for all deer harvested on the Depot. In addition, the width of antler spread and the number of points on all harvested bucks are recorded. In addition to monitoring the deer through harvest data, the Depot monitors the deer population with deer spotlight counts using SCDNR's technique whereby the effective sight distance is estimated by the deer counters. This information is provided to the SCDNR, which then issues antlerless deer and buck tags allowing the harvest of deer in order to maintain a low deer population. This maintains deer herd health and reduces the potential for deer/automobile collisions on the Depot.

Deer hunting was first initiated in 1997, and harvested deer have been weighed, aged, and examined for general health since that time. Deer weights and fat indices have increased as the deer herd numbers have been reduced. The SCDNR uses the previous year's harvest report to recommend whether the Depot should participate in deer harvest activities the following year. If it is recommended that the Depot conduct a harvest event the next year, SCDNR will recommend the number of deer to be harvested from the island. Hunting events at the Depot usually take place every other Saturday throughout the designated deer harvest season beginning with the State mandated antlerless deer season (usually mid-September). Additional details can be found in the Controlled Deer Hunt Standard Operating Procedure (Appendix V).

3.9.3 Migratory Birds

Migratory birds are protected by the MBTA (16 USC 703) and by Executive Order 13186. The MBTA prohibits the taking of migratory birds. For military readiness activities, the DOD has an exemption from the take provisions of the MBTA. Note that this exemption does not apply to routine actions such as facility construction and day-to-day operations. Readiness activities do include such things as military training and operations. For example, use of the rifle range would be a military readiness action while siting a new range would not.

As part of the exemption, the Marine Corps is required to confer and cooperate with the USDOI if the level of take from military readiness activities is ever enough to have "significant

adverse effect" on a population of migratory birds. Determining when a significant adverse effect occurs requires monitoring.

Beyond the MBTA, other federal laws, Executive Orders, and state initiatives also encourage the positive management of migratory birds by the DOD. These positive efforts have been ongoing for some time and have provided much positive publicity for the DOD within the professional biological community. The Partners in Flight (PIF) initiative is the primary program in the western hemisphere for managing migratory birds. The DOD is a major cooperator and signatory in this agreement. It provides for international efforts to stop and reverse the documented declines in many bird species populations. Following and complementing the PIF, the Federal Government has several ongoing programs including the U.S. Shorebird Conservation Plan, North American Waterbird Conservation Plan, and North American Bird Conservation Initiative. The DOD participates in all of these programs at various installations across the country. The Depot has contributed to all of them in its natural resources management.

The DOD PIF program has set several priorities for the southeastern United States; those that pertain to the Depot include:

- Document maritime bird communities under DOD management.
- Maintain disturbance regimes and conduct habitat management to support priority bird species.
- Monitor and protect colonial nesting waterbirds and vulnerable shorebirds.
- Identify and conserve critical shorebird and non-game waterbird habitats.
- Educate Installation personnel and military residents on the negative impact of cats to birds and other wildlife.

Migratory birds at MCRD Parris Island are abundant and diverse with over 150 species detected during surveys by NAVFAC SE and Depot personnel mostly in summer and winter. More species could be detected if more extensive surveys were conducted during the migratory seasons. Several areas of the Depot have been identified as important to migratory birds; these include the maritime forest (important for painted buntings [Figure 11] and migrating birds), the open tidal flats (shorebirds and American white ibis [*Eudocimus albus*]), Third Battalion Pond (waterfowl, wading birds, and the bald eagle), hammock islands (bald eagles, painted buntings, and migrating birds), and the shrub edge communities (painted buntings and migrating birds). Bald eagles nest on Gibbs and Goat Islands, Third Battalion Pond and Elliott's Beach. Figure 8 above provides the locations of the current and previous nest trees and adjacent management zones. While the bald eagle has been delisted and is no longer endangered or threatened, it is still protected by the Bald and Golden Eagle Protection Act and the MBTA; consequently, a Bald Eagle Management Plan has been developed by the USFWS (2007) and is provided in Appendix VI.

Figure 11. Painted bunting (Passerina ciris) (Photo courtesy of Paul Sykes)

Since management for all species is impossible, the various groups interested in management of birds have come up with lists of priority species. On MCRD Parris Island, the management emphasis for migratory birds will be those priority species that frequently occur on the Depot. These include the bald eagle, painted bunting, brown-headed nuthatch, saltmarsh sparrow (*Ammospiza caudacuta*), colony nesting wading birds, and shorebirds. Other species may be identified as priority species in the future. Birds on the Depot are closely monitored to ensure that their safety and habitats are maintained due to the nature of the training activities taking place. If any birds of prey are found injured or sick, Depot personnel shall contact the South Carolina Raptor Center in Awendaw to arrange to transport the bird.

The Depot maintains 40 blue bird nest boxes. The boxes are observed to ensure they are used, properly maintained, and functional for use. The Depot also erected 20 osprey nest platforms in the 1980's which are monitored for nesting activity annually and reported to the Lowcountry Institute on Spring Island, SC who then report data on the Center for Conservation Biology's Osprey Watch network and the International Osprey Foundation's Osprey Nest Reporting Network.

3.9.4 Other Non-game Species

Of the many species present on the Depot, the diamondback terrapin (*Malaclemys terrapin*) and eastern diamondback rattlesnake (*Crotalus adamanteus*) are two non-bird species that are identified in South Carolina's State Wildlife Action Plan (SCDNR 2015) as being in need of management. Both species occur on the Depot, the rattlesnake rather commonly. Monitoring data was collected between 2008 and 2011 to identify amphibian and reptile species occurrence and distribution on MCRD Parris Island with respect to land use. The herpetofaunal species inventory identified 27 species: eight anuran, six lizard, eight snake, four turtle, and one alligator. The data collected also provides baseline data and allows MCRD Parris Island natural resources personnel to monitor populations, specifically eastern diamondback rattlesnake, and take preventative measures to reduce human-rattlesnake encounters. Results of that study showed that the distribution of the eastern diamondback rattlesnake was largely limited to naturalized habitats, particularly along marsh edges. The eastern diamondback rattlesnake seems to restrict their activity to areas with low human activity and actively avoid areas that increase their exposure to risks. The baseline data can be used to present management scenarios in light of eastern diamondback rattlesnake behavior, movement, and demography, providing insight into potential costs and benefits for relevant stakeholders. The eastern diamondback rattlesnake is still under review for listing under the ESA. The Depot has

been continually monitoring the population since 2008.

Dangerous or nuisance wildlife is defined as species that have the potential to attack or inflict harm on humans if provoked. Examples of dangerous or nuisance wildlife found on Parris Island include, but are not limited to: eastern diamondback rattlesnake, raccoons, feral cats, and American alligators. Euthanizing of animals by NR Staff is avoided unless it is absolutely necessary. The Depot maintains a special permit (specific to alligators) from the SCDNR that allows the dispatch, transfer, or disposal of nuisance alligators.

3.10 THREATENED AND ENDANGERED SPECIES

The ESA defines a threatened species as "a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" and an endangered species as "a species that is in danger of extinction throughout all or a significant portion of its range" (50 CFR 424.02). When a species is listed as threatened or endangered, the ESA requires the designation of critical habitat (habitat areas essential to the conservation of the species) unless designation would not be prudent or the critical habitat is not determinable. On MCRD Parris Island, there are no areas currently designated as critical habitat for threatened or endangered species.

A 2021 review of the USFWS Information, Planning, and Consultation (IPaC) system for Parris Island indicates that there are 15 federally listed threatened and endangered species that are known to occur or have the potential to occur on the Depot, including two mammals, five bird species, four reptiles, one amphibian, and three flowering plant species. These results are included below in Table 5. Seven *additional* species listed by the state as threatened or endangered potentially occur within Beaufort County (SCDNR 2021) (see Table 5). Many of the listed species have the potential to occur on Parris Island but do not occur there. The seven listed species that have been observed on Parris Island are discussed below. Descriptions of the federally listed northern long-eared bat (*Myotis septentrionalis)* and the state-listed Rafinesque's big-eared bat (*Corynorhinus rafinesquii)* are included because although they have not been observed, they are thought to potentially feed and roost at the Depot. Additional details about wildlife protection and management practices employed at the Depot can be found in Section 4 Natural Resource Management and in the 2013 MCRD Parris Island Wildlife Protection Standard Operating Procedure (SOP). The SOP provides guidance on the types of wildlife monitoring programs established at the Depot and ensures compliance with all applicable wildlife conservation laws and regulations.

Table 5. Federal- and State-Listed Threatened and Endangered Species Potentially Occurring on MCRD Parris Island

Species Common Name	Scientific Name	Federally Listed Species Potentially Occurring on Parris Island	State-Listed Species Potentially Occurring in Beaufort County	Documented Occurrence at MCRD Parris Island?
Mammals				
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened	--	Ongoing

Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*	--	Endangered	Ongoing

Table 5. Federal- and State-Listed Threatened and Endangered Species Potentially Occurring on MCRD Parris Island

Species Common Name	Scientific Name	Federally Listed Species Potentially Occurring on Parris Island	State-Listed Species Potentially Occurring in Beaufort County	Documented Occurrence at MCRD Parris Island?
West Indian Manatee	*Trichechus manatus*	Threatened	Endangered	Documented near Elliott's Beach and the entrance to old marina[1]
Birds				
Bald Eagle,	*Haliaeetus leucocephalus*	--	Threatened	Documented nests Elliott's Beach, Third Battalion Pond, Goat Island, east of Page Field[1]
Eastern Black Rail	*Laterallus jamaicensis ssp. Jamaicensis*	Threatened	--	--
Least Tern	*Sterna antillarum*	--	Threatened	Documented feeding in waters on and around the Depot[1]
Northern Dwarf Siren	*Pseudobranchus striatus*	--	Threatened	--
Piping Plover	*Charadrius melodus*	Threatened	--	Documented on the sand flat near the southern end of the Depot[1]
Red Knot	*Calidris canutus rufa*	Threatened	--	Documented at the Depot[2]
Red-cockaded Woodpecker	*Picoides borealis*	Endangered	Endangered	--
Wilson's Plover	*Charadrius wilsonia*	--	Threatened	Documented at the Depot[1]
Wood Stork	*Mycteria americana*	Threatened	Endangered	Documented feeding and loafing over wetlands[1]
Reptiles				
Green Sea Turtle	*Chelonia mydas*	Threatened	--	--
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	Endangered	--
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	--	--

Table 5. Federal- and State-Listed Threatened and Endangered Species Potentially Occurring on MCRD Parris Island

Species Common Name	Scientific Name	Federally Listed Species Potentially Occurring on Parris Island	State-Listed Species Potentially Occurring in Beaufort County	Documented Occurrence at MCRD Parris Island?
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	Threatened	Nesting documented in 2021 on SW beach.
Southern Hog-nosed Snake	*Heterodon simus*		Threatened	--
Amphibians				
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	Threatened	--	--
Fish				
Shortnose Sturgeon	*Acipenser brevirostrum*	--	Endangered	--
Flowering Plants				
American Chaffseed	*Schwalbea americana*	Endangered	--	--
Canby's Dropwort	*Oxypolis canbyi*	Endangered	--	--
Pondberry	*Lindera melissifolia*	Endangered	--	--

Sources: USFWS IPaC (https://ecos.fws.gov/ipac/), 2021; SCDNR (https://www.dnr.sc.gov/species/index.html), 2021

[1] Cited in MCRDPI EA for Implementation of an Energy Savings Performance Contract 2016
[2] Cited in MCRDPI 2008 INRMP

3.10.1 Descriptions of Protected Species Observed or Potentially Found on the Depot

Northern Long-Eared Bat (*Myotis septentrionalis*)

- Status: Threatened - Federal.
- Habitat Use and Requirements: Northern long-eared bats hibernate in caves and mines, swarming in surrounding wooded areas in autumn. During late spring and summer, they roost and forage in upland forests. They primarily fly through the understory of forested areas

feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation.

- Habitat Conditions: Although no species were captured during recent surveys, potential habitat occurs in hardwood sites with large trees.

- Limiting Factors: The northern long-eared bat is one of the species of bats most impacted by the disease white-nose syndrome (declining by up to 99 percent in the northeast). In addition, gates or other structures intended to exclude people from caves and mines not only restrict bat flight and movement, but also change airflow and internal cave and mine microclimates. A change of even a few degrees can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Arousal during hibernation causes bats to use up their already reduced energy stores, which may lead to individuals not surviving the winter. Highway construction, commercial development, surface mining, and wind facility construction permanently remove habitat.

- Current Status: Possible resident. No individuals have been located in current surveys (acoustic and mist-netting are ongoing).

Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*)

- 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 2-100 individuals.

- Habitat Conditions: Although no species were captured during recent surveys, 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 forests may reduce their ability to move between different forested areas.

- Current Status: Possible resident. No individuals have been located in current surveys (acoustic and mist-netting are ongoing).

West Indian Manatee (*Trichechus manatus)*

- Status: Threatened - Federal and Endangered – State.

- Habitat Use and Requirements: Manatees live in marine, brackish, and freshwater systems in coastal and riverine areas. Their preferred habitats include areas near the shore with

underwater vegetation like seagrass and eelgrass. They feed along grass bed margins with access to deep water channels, where they flee when threatened.

- Habitat Conditions: Manatees can be found throughout the Caribbean basin, including the southeastern United States, eastern Mexico, eastern Central America, northeastern South America, and the Greater Antilles. Manatees have been observed in waters adjacent to the Depot (Figure 12).

- Limiting Factors: Primary threats to the West Indian manatee include habitat loss and fragmentation, entanglements in fishing gear, and collisions with boats.

- Current Status on the Depot: Manatees have been seen moving through the Depot's adjacent estuary during summer wandering movements and near the boat ramp at Elliott's Beach and the entrance to the old marina (no longer exists).

Figure 12. West Indian Manatee. Note: photo courtesy of USFWS.

Bald Eagle (*Haliaeetus leucocephalus*)

- Status: Threatened - State.

- Habitat Use and Requirements: Bald eagles are a North American species; they generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees, snags (dead trees), cliffs, rock promontories, rarely on the ground, and with increasing frequency on human-made structures such as power poles and communication towers. Nest sites typically include at least one perch with a clear view of the water where eagles usually forage. Shoreline trees or snags often provide the visibility and accessibility needed to locate aquatic prey.

- Habitat Conditions: There are active bald eagle nest sites to the east of Page Field (Gibbs Island), north of Archer's Creek (Goat Island), Elliott's Beach (osprey nesting platform) and northern edge of Third Battalion Pond. Negative impacts to the nest could occur during construction or training activities if noise-producing activities result in disturbance to the nest and abandonment of eggs or hatchlings. However, if the project or training are proposed to take place in the winter or spring during the nesting season, a qualified biologist should survey the nest sites to determine occupancy, prior to the activity. If the nests are active, the Marine Corps should implement appropriate measures to protect the nests and roosts from activity impacts until the nest is naturally abandoned for the season.

- Limiting Factors: Human activity may agitate or bother roosting or foraging bald eagles to the degree that interferes with or interrupts their breeding, feeding, or sheltering behavior, causing injury, death, or nest abandonment. Activities that permanently alter eagle habitat can eliminate the elements that are essential for feeding and sheltering eagles. Also, bald eagles' penchant for feeding on roadkill and euthanized animal carcasses at landfills and feedlots can be deadly; collision with cars and ingestion of secondary poisoning are both significant causes of eagle mortalities.

- Current Status: Bald eagle are confirmed residents and four active nest sites are currently located on the Depot with frequently observed foraging.

Least Tern (*Sterna antillarum*)

- Status: Threatened - State.

- Habitat Use and Requirements: Least terns prefer vegetation-free sand or gravel islands for nesting, although beaches may also be used. Least terns prefer areas remote from trees or other vegetation that may hide or support predators. Least terns are primarily piscivores (fish-eaters), and feed opportunistically on small fish species or the young of larger fish species, foraging for fish in shallow water habitats. The least terns' fall migration generally follows major river basins to their confluence with the Mississippi River and then south to the Gulf of Mexico.

- Habitat Conditions: Least terns are likely considered transient individuals, not using the Depot for breeding, but rather for limited foraging activities in the adjacent waters.

- Limiting Factors: Much of their natural habitat has been lost because of broad-scale changes to natural river systems that include invasive plants, dams and reservoirs, river channelization, bank stabilization, hydropower generation, and water diversion.

- Current Status: The least tern has been observed feeding in the waters on and around the Depot, but no documented breeding has been observed.

Piping Plover (*Charadrius melodus*)

- Status: Threatened - Federal.

- Habitat Use and Requirements: Piping plovers use wide, flat, open, sandy beaches with very

little grass or other vegetation. Nesting territories often include small creeks or wetlands. Piping plovers are migratory birds; in the spring and summer, they breed in northern United States and Canada, and in the fall, they migrate south and winter along the coast of the Gulf of Mexico or other southern locations.

- Habitat Conditions: Piping plovers are likely considered transient individuals, not using the Depot for breeding, but rather for limited foraging activities during migration.

- Limiting Factors: Many of the coastal beaches traditionally used by piping plovers for nesting have been lost to commercial, residential, and recreational developments. Through the use of dams or other water control structures, humans are able to raise and lower the water levels of many lakes and rivers of plover inland nest sites. Too much water in the spring floods the plovers' nests. Too little water over a long period of time allows grasses and other vegetation to grow on the prime nesting beaches, making these sites unsuitable for successful nesting.

- Piping plovers are also very sensitive to the presence of humans. Too much disturbance causes the parent birds to abandon their nest. People using the beaches where the birds nest sometimes accidentally crush eggs or young birds. Dogs and cats often harass and kill the birds. Other animals, such as fox, gulls, and crows, prey on the young plovers or eggs.

- Current Status: Piping plovers have been observed on nearby coastal beaches, as well as the sand flat near the southern end of the Depot.

Red Knot (*Calidris canutus rufa*)

- Status: Threatened - Federal.

- Habitat Use and Requirements: Some knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants. Red knots feed on invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab eggs. Migrating knots can complete non-stop flights of 1,500 miles or more, converging on vital stopover areas to rest and refuel. They arrive at stopover areas with depleted energy reserves and must quickly rebuild their body fat to complete their annual migrations.

- Habitat Conditions: Red knots use the Depot for limited foraging activities during migration.

- Limiting Factors: Coastal development and overharvest of the horseshoe crab took a toll on the red knot populations. The smaller populations that remain now face many hurdles to recovery, including: sea-level rise, coastal development, shoreline stabilization, dredging, reduced food availability at stopover areas, disturbance by vehicles, people, dogs, aircraft, and boats, and climate change.

- Current Status: Red knot have been observed on the Depot during their migration.
- Management: Other than controlling human access to sandy areas and limiting construction activities in these areas, no special management is needed at this time.

Wilson's Plover (*Charadrius wilsonia*)

- Status: Threatened - State.
- Habitat Use and Requirements: Wilson's plovers prefer open beaches, tidal flats, and sandy islands. They are found only in coastal regions, typically in very open areas such as white sand or shell beaches, estuaries, tidal mudflats. Wilson's plovers typically run a few steps and then pause, then run again, pecking at the ground for crustaceans, worms, or insects.
- Habitat Conditions: Wilson's plovers are considered transient individuals, not using the Depot for breeding, but rather for limited foraging activities during migration.
- Limiting Factors: Wilson's Plover is threatened by habitat loss. Beachfront development and human activity on its breeding, migration, and wintering grounds lead to a decreasing population. They are also vulnerable to global climate change and associated sea-level rise.
- Current Status: Wilson's plover have been observed on the Depot during their migration.
- Management: Other than controlling human access to sandy areas and limiting construction activities in these areas, no special management is needed at this time.

Wood Stork (*Mycteria americana*)

- Status: Endangered - State and 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, where fish become concentrated during periods of falling water levels. The storks will travel up to 80 miles (130 km) 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: The Depot's marshes provide feeding habitat for the wood stork (Figure 13). Certain borrow pits that currently flood with each tide may provide the opportunity for the Depot to improve habitat for wood storks.
- Limiting Factors: Wood stork decline is the result of loss of suitable feeding habitat and rookery sites.
- Current Status: Regular visitor. Storks are frequently observed on the Depot feeding and loafing.
- Management: Maintain existing wetlands. Investigate the feasibility of managing the currently tidal borrow pits for wood stork feeding habitat.

Figure 13. Wood Storks Loafing with Great Egrets Near Entrance Causeway to MCRD Parris Island

3.11 BIODIVERSITY AND ECOSYSTEM MANAGEMENT

Biological diversity of non-marine habitats at MCRD Parris Island is relatively low (See Appendix IV for lists of species confirmed as present on the Depot). The low diversity at Parris Island is believed to result from a lack of plant communities (freshwater wetlands are almost absent) and historical disturbance of the existing communities. Previous surveys did not document a large number of plant species on the Depot; however, more intensive, ongoing studies are likely to expand the number of confirmed species on the Depot.

This same lack of diversity is evident in the low numbers of amphibians and reptiles (individuals and species) on the Depot. No salamanders were found at all on Parris Island; however the wetland on Doggie Island, which is in a range impact area, was not surveyed at this time and it may have salamanders. The low numbers and species of amphibians on the Depot is believed to be due to the long history of use of the property, the geographic locations that prevent recolonization of extirpated species, and lack of freshwater wetlands on Parris Island. Nothing short of the creation of numerous freshwater wetlands and reintroducing various native amphibians would be likely to change this situation.

Fewer reptile species, especially snakes, may be the result of low mammal numbers, the large number of roads, and the number of people in the woods. Anecdotal reports indicate that snakes are frequently killed on Parris Island, with people killing snakes on sight or aiming for them when driving. Harming wildlife, the intentional act of injuring or killing an animal, by any staff member, personnel, or visitor is strictly prohibited at MCRD Parris Island. The harassment of wildlife by any staff member, personnel, or visitor is also strictly prohibited on the Depot. The harassing of wildlife is defined as an intentional act that creates the likelihood of injury to wildlife by annoying it such to an extent as to significantly disrupt normal patterns, including breeding, nesting, feeding, and sheltering.

Small mammals are also rather uncommon on the Depot with few species represented. Several factors have likely contributed to the lack of small mammal species on the Depot:

- The relatively thick forest overstory reduces herbaceous vegetation, which provides cover for small mammals. Also, the historical lack of prescribed fire (which has been increased recently) allows shrubby species to grow up in the understory and further reduces the production of herbaceous vegetation and groundcover. The large numbers of deer eat much of the remaining herbaceous vegetation, again reducing cover for small mammals.

- The distribution of Parris Island's lands among small islands, which have been developed into primarily inhospitable habitats, makes recolonization of any areas that have lost species difficult.

The relatively higher diversity of birds on MCRD Parris Island, when compared to plants, amphibians, reptiles and mammals, may have resulted from several factors. First, the island has a long history of post-Columbian human occupation; and, second, the more intensive military use of the island during past wars and conflicts may have extirpated many species from the Depot. Birds would be able to re-colonize the areas immediately following reductions in training and recovery of the vegetation while recolonization by the less mobile amphibians, reptiles, and mammals would take longer. Bird species diversity responds to the three-dimensional forest more than that of amphibians, reptiles, and mammals. This allows for a greater diversity of birds even without a well-developed ground layer of vegetation.

Another southeastern species that was absent from the Depot is the southern fox squirrel (*Sciurus niger niger*). The current forest conditions are such that it might be feasible to re-introduce the fox squirrel into the Depot's forested areas without significant alterations of the habitat or planned forest management. Re-introduction was initiated in 2016 with Marshall University researchers. Current conservations and live trapping results indicate the population is doing well and reproducing. Ongoing research continues to monitor the population to determine health, size and reproductive activity.

Finally, horseshoe crabs (*Limulus polyphemus*) are common along the southern shores, tidal creeks and saltmarshes of MCRD Parris Island. The horseshoe crab's eggs are a very important food source for migrating shorebirds so the continued abundance of the species along the shores of MCRD Parris Island is important in maintaining an abundance of shorebirds in the area. Horseshoe crab spawning research on the Depot by SCDNR biologists is currently ongoing. Management strategies could arise from the results along with a new, updated Cooperative Agreement with SCDNR.

Recent trends in natural resource management have emphasized ecosystem management, which, while more technical definitions are numerous in the literature, means managing to mimic natural processes over large areas for a variety of organisms (biodiversity). It is important to note that smaller properties within the overall landscape may be managed more for single species or small groups of species in order to achieve the greater biodiversity in the landscape.

For a variety of reasons, increased biodiversity is generally associated with healthier, "natural" ecosystems and is frequently desirable as a product of management even when many or most of the

species being increased or maintained by the management are not utilized. The increased biodiversity frequently, but not always, comes at the cost of reduced harvestable products such as deer and timber.

3.12 FOREST RESOURCES

MCRD Parris Island manages approximately 1,200 acres of forestland. There are another 59 acres of forested islands in the range surface danger zone that are not managed. The predominant forest cover at the Depot is slash pine, with lesser amounts of forest cover in loblolly pine, pine/hardwood, and hardwood. Most forest stands are even-aged and 50-60 years old.

Basic stand data, prescriptions, and records of completed actions are stored in a Forest Management Information System (FMIS) database. MCRD Parris Island uses this database in its forest management program. FMIS provides a means of recording and retrieving forest management data required for inventory control, analysis of stand information, and forest practices.

Of the 1,200 acres of managed forest, about 352 acres are on Page Field which is used extensively for training and not available for regeneration cuts, 71 acres are on hammock islands, 78 acres are within range safety zones, 40 acres are in buffers or other protected sites, and about 115 acres are live oaks, which are essentially not marketable. Overall, just a little over 500 acres of forest are relatively unconstrained and available for cutting; however, cutting on much of this land is also problematic because of visual and other access issues.

3.13 OUTDOOR RECREATION

Outdoor recreation is the use of natural resources, including indoor interpretative centers, where the focus is on the understanding of the natural environment. Outdoor recreation includes facilities such as nature trails, picnic and camping areas, scenic rivers, equestrian areas and other consumptive and non-consumptive uses of natural resources. The use of off-road vehicles, as well as highly developed outdoor uses such as golf courses and tennis courts, are not considered outdoor recreation in the context of this natural resources plan. The Depot has adequate resources to support programs for hunting, fishing, and the non-consumptive enjoyment of nature through walking, sitting, and observing. In fact, beautiful vistas of tidal marsh and rivers are present all around the Depot.

Swimming (other than swimming pools which are not covered under the Natural Resource Management Program) and surfing opportunities are not available at the Depot.

MCRD Parris Island has sponsored events such as Earth Day and Migratory Bird Day to provide recreational opportunities and educate Marines, their dependents, and civilian personnel about the natural environment.

Overall public access is addressed in the Standards and Guidelines, Appendix I. Persons trying to hunt or otherwise recreate on the upland portions of Parris Island are likely to enter areas that are unsafe or otherwise unsuitable for access by the general public. The access is limited because training recruits occupies most natural uplands almost every day. Allowing the general public to access the few areas that are not occupied or closed due to range use would entail too great a risk that the public would inadvertently enter unsafe areas. Allowing access of the tidal creeks does not pose this risk, other than in the range surface danger zone, because persons fishing from boats are not likely to leave the boats and enter Parris Island lands. This is similar to the access allowed the public for

graduation exercises where they are directed to the Mainside Parade Deck.

3.13.1 Hunting and Trapping

Recreational opportunities for hunting are present at the Depot. Deer is the only species currently authorized for hunting through strictly controlled herd reduction hunts. The SCDNR uses the previous year's harvest report to recommend whether the Depot should participate in deer harvest activities the following year, and, if so, will then recommend the number of deer to be harvested from the island. Hunters must comply with all applicable State of South Carolina, Depot and Federal regulations. Active-duty military (and dependents 18 and older), retired military and Parris Island civil service/non-appropriated fund employees are eligible to hunt. Other details about hunting are provided in Depot Controlled Deer Hunt SOP (Appendix V).

All hunters must possess a valid South Carolina Hunting License, Big Game Permit, and if born after June 30, 1979, must have passed the SC Hunter's Education Course. An application to hunt must be filled out and submitted. The applicant must sign both a Certificate of Release which releases the Federal Government from all responsibility in case of accident or injury while hunting and a Certificate of Understanding, which certifies the applicant's familiarity with current regulations. Hunting regulations for MCRD Parris Island are further described by the Deer Reduction Hunt Depot Bulletin and Deer Controlled Hunt SOP which is issued prior to each year's hunting season.

Other than live trapping for research purposes, furbearer trapping is not authorized on the Depot.

3.13.2 Fishing

Only active and retired military personnel, their dependents, houseguest of the military personnel (when accompanied by their sponsor) and Depot civilian employees may fish from the shore or platforms on the Depot.

The general public may fish the tidal creeks from boats except those areas closed for safety because of potential impacts from the rifle range (see Figure 3 above for a map of the range surface danger zones at MCRD Parris Island).

Management of the estuarine fishery around the Depot by the Marine Corps is limited to: (1) protection from fill and pollution, (2) providing access through either boat ramps or fishing piers (Figure 14), (3) providing law enforcement on the Depot, and (4) saltwater fishing from banks and piers in accordance with state regulations. Access to the shellfish areas specified under the cooperative agreement with SCDNR by the general public is allowed by boat. Access to areas within the impact area of the rifle range are closed to boats during operation of the range; Installation personnel may access the shellfish areas from land. Fish, shellfish, shrimp, and crab harvesting practices are monitored to ensure all fishermen are in compliance with all federal and SC regulations. No freshwater fishing program exists due to the lack of freshwater fisheries.

3.13.3 Commercial Harvest

Commercial harvesting of oysters, clams, and horseshoe crabs is currently regulated by

SCDNR. The oyster and clam harvest is allowed in accordance with the 1978 Cooperative Agreement with SCDNR for the shellfish beds (Appendix VII). Actual harvesting is regulated and may be changed as needed by SCDNR to conserve the resource. Horseshoe crab harvest is allowed in accordance with the Code of Laws of South Carolina Section 50-5-1330. Thus, only hand harvest of horseshoe crabs for biomedical work is allowed, and the horseshoe crabs must be returned to the water after use near their point of take. Current horseshoe cab spawning research on the Depot by SCDNR may result in adjustments to this regulation and activity on the Depot.

3.13.4 Nature Trails and Study

Long distance walking trails are not currently provided at the Depot due to a lack of contiguous undeveloped lands. A short nature trail exists between the two causeways on the northwest side of Third Battalion Pond and another is near Ribault Monument (Figure 15). Two new short nature trails are in process (as of 2021) associated with the newly established and ongoing development of the Earth Day Park north of the Marine Corps Exchange and west of the Public Works Division parking lot (eastern edge of Third Battalion Pond). Picnic areas are present on Horse Island, north of Third Battalion Pond, and Elliott's Beach (Figure 16). Two additional nature observation platforms (not suitable for fishing) have also been constructed on the Depot. One is across the road northeast of Third Battalion Pond (Scout Island) and the other is near Ribault Monument (Figures 17 and 18). Many of these outdoor recreation facilities have interpretive displays, which will need maintenance and could also be enhanced. The shoulders of most roads between islands are wide enough for joggers and can easily be used for nature observation.

Beautiful views of the marsh and rivers are present at the picnic areas, boat ramps, observation platforms, golf course, and many roadsides.

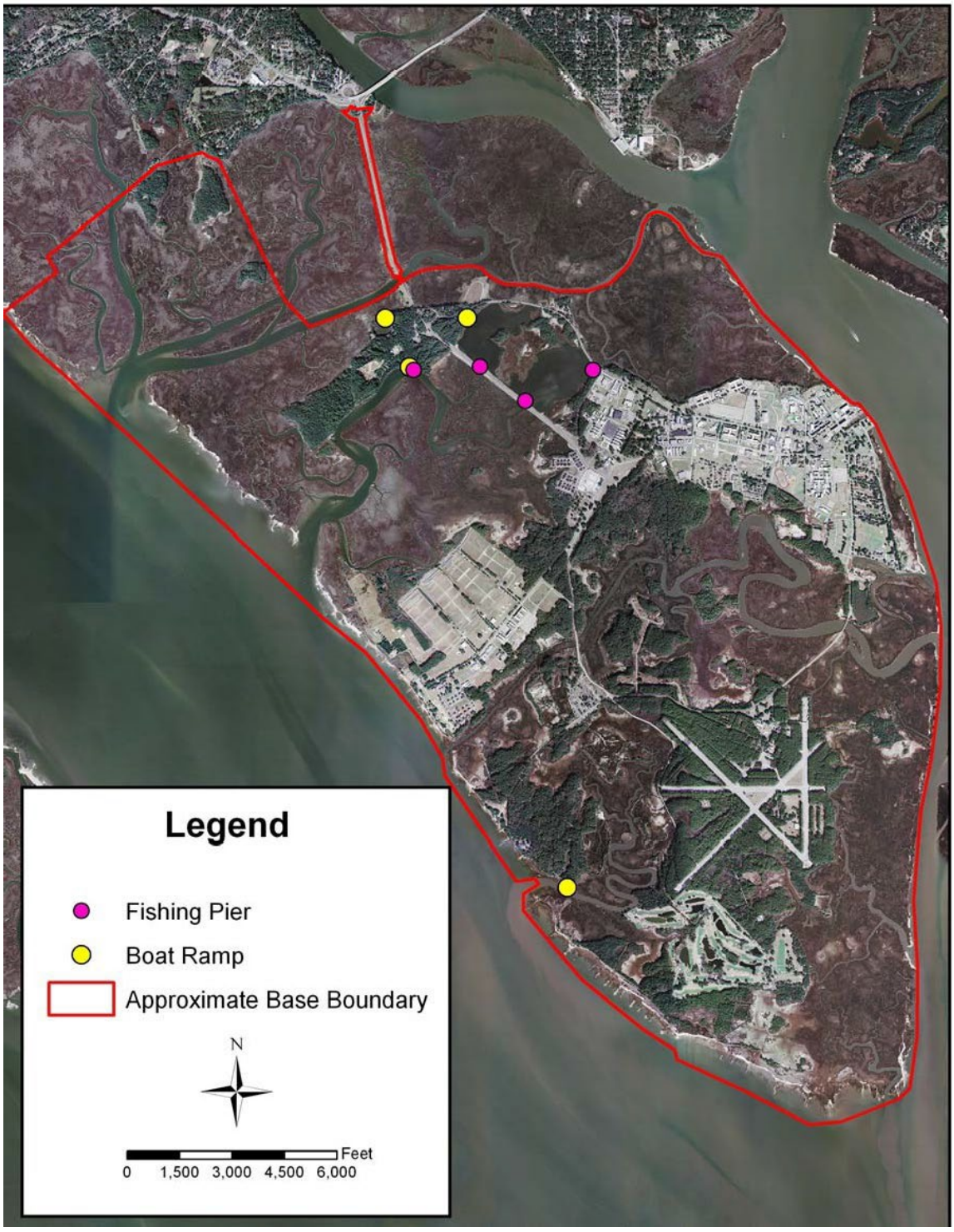


Figure 14. Boat Ramps and Fishing Piers at MCRD Parris Island, SC

Figure 15. Nature Trails at MCRD Parris Island, SC

Figure 16. Picnic Areas at MCRD Parris Island, SC

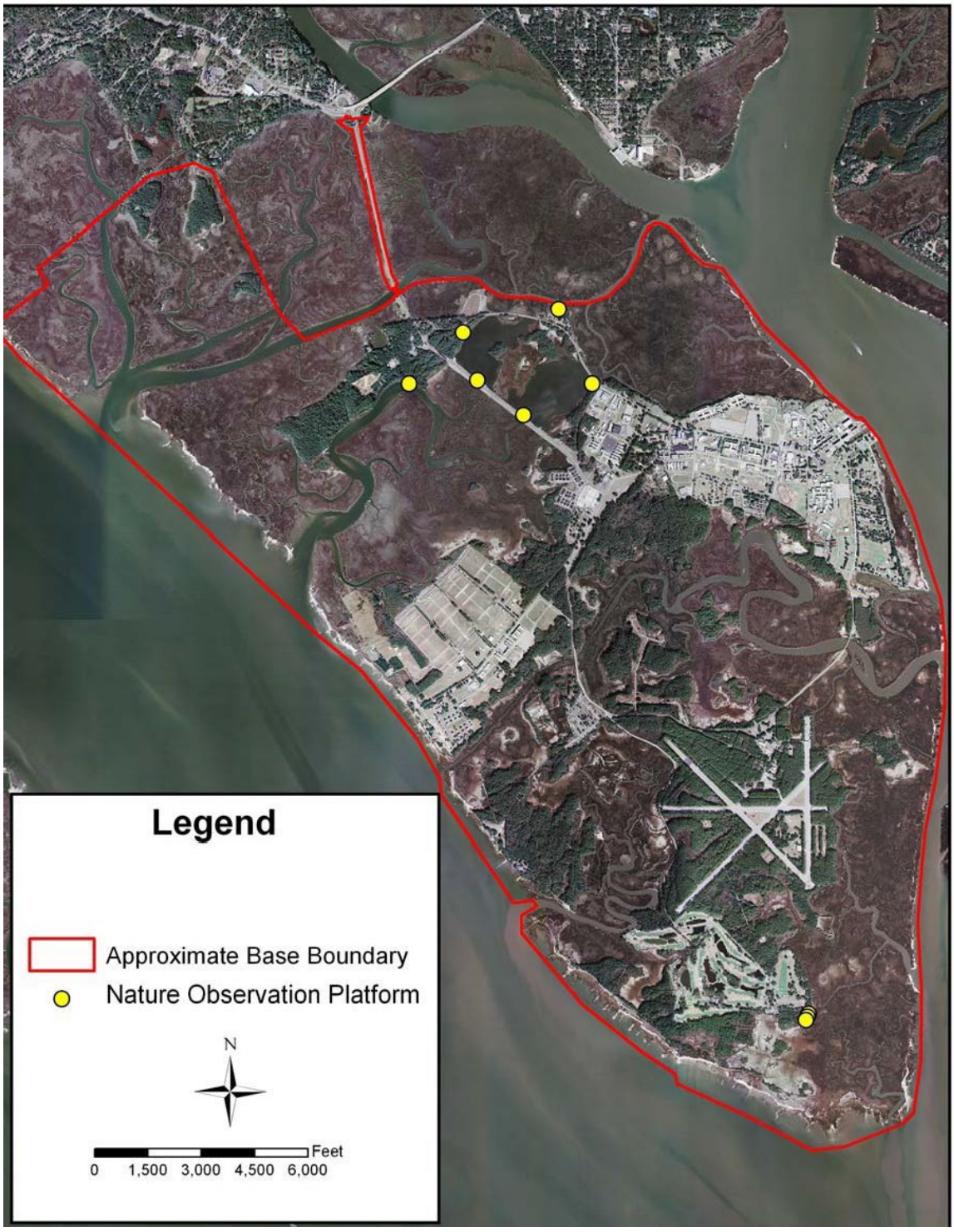


Figure 17. Locations of Nature Observation Platforms at MCRD Parris Island, SC

Figure 18. Nature Observation Platform Near Ribaut Monument

3.13.5 Boating

Several water resources on and adjacent to the Depot are available for non- motorized (such as canoeing), and motorized boating. Two boat ramps (Figure 8) provide boating access from the Depot to the tidal creeks or the Beaufort and Broad Rivers. The tidal creeks are also accessible to anyone from the rivers except for those areas closed during range operations.

3.13.6 Picnic and Camping Areas

Picnicking is a universally popular outdoor recreation activity. Picnic areas are present on Horse Island, Elliot's Beach, and north of Third Battalion Pond (Figure 16 above). Several areas are located on Mainside adjacent to the old MCX site and the new MCX site, and at the end of Wake Boulevard near the ranges. Recreational camping is not allowed on the Depot.

3.13.7 Scenic Areas

The various fishing and observation piers provide beautiful vistas as do the picnic areas, the golf course, and a variety of other sites.

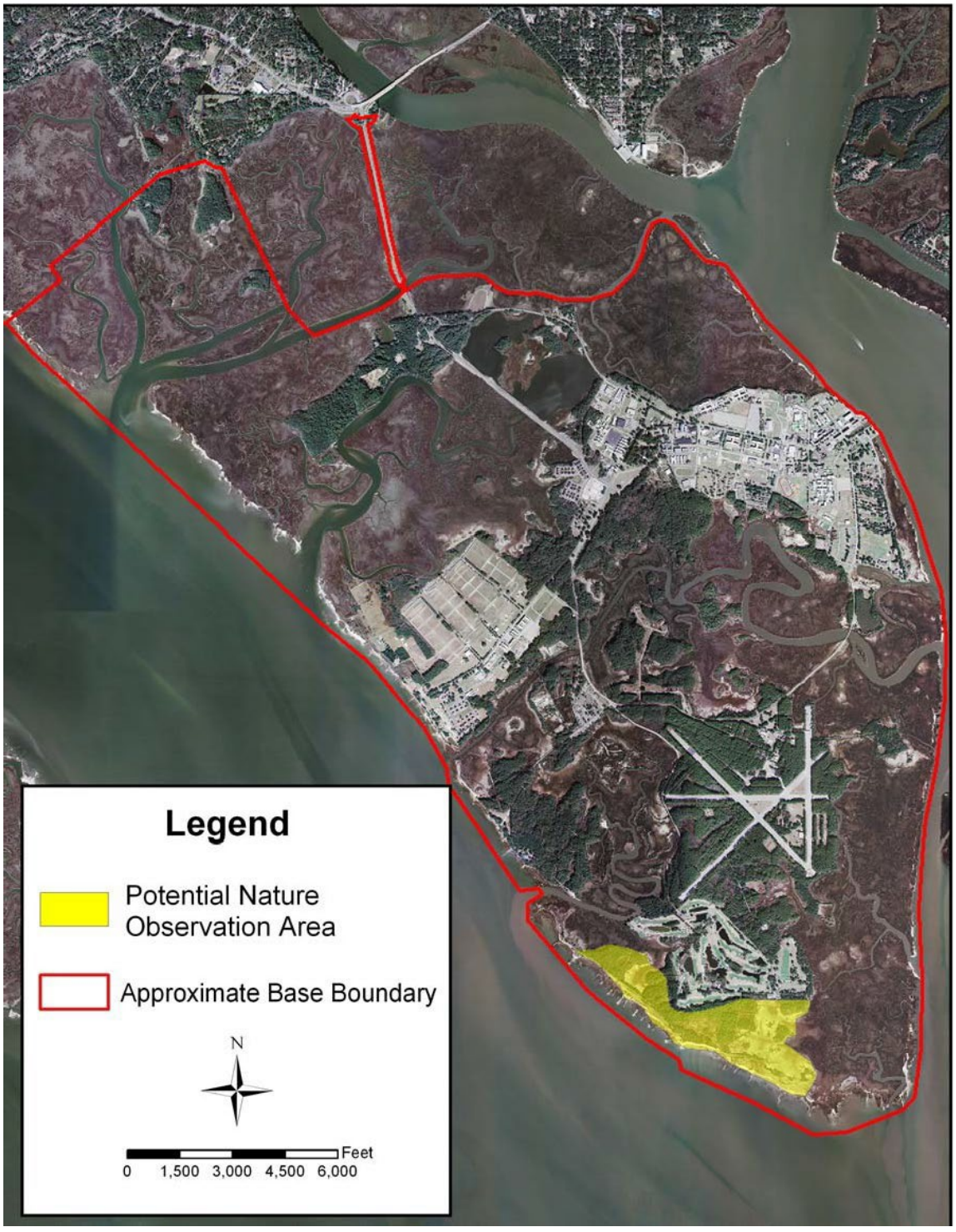


Figure 19. Potential Nature Observation Area at MCRD Parris Island

4.0 NATURAL RESOURCE MANAGEMENT

This section discusses natural resource management at MCRD Parris Island by dividing natural resources into focus units: land management, forest management, fish and wildlife, and outdoor recreation. These focus units are further divided into subunits; for example, the land management discussion addresses wetlands, soil conservation and erosion control, and invasive and exotic species. For each subunit, Section 4 discusses the objectives, long-term management, and identifies strategies and projects. Each subunit also identifies legal requirements and sources for additional management information. This section also discusses management recommendations for law enforcement, staffing and training, monitoring, and INRMP reviews and updates.

A detailed description of all recommended projects is provided in Section 5.0 Natural Resources Projects.

4.1 LAND MANAGEMENT

This section addresses the land resources on the Depot that are managed as individual components and have independent management programs and techniques. The land management issues contained within this plan are not intended for directing land use activity (i.e., what buildings or activities should go where), but rather to provide managers with directions and general techniques to protect and enhance the natural environment, while continuing to provide the resources to support the military mission of MCRD Parris Island.

4.1.1 Wetlands

In general terms, wetlands are lands on which water covers the soil or is present either at or near the surface of the soil or within the root zone all year or for varying periods of time during the year, including during the growing season. The USACE (Federal Register, Section 328.3[b], 1991) and the EPA (Federal Register, Section 230.4[t], 1991) jointly define wetlands as "…those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE 1982). The USACE definition relies on three key parameters – hydrology, soil, and vegetation – which must all occur and meet the defined characteristics in order for a location to be classified as a wetland. MCRD Parris Island has extensive areas of salt marsh, i.e. tidal wetlands, tidal creeks and rivers. MCRD Parris Island has very little in the way of freshwater wetlands.

Figure 20. Parris Island wetlands being used by juvenile white ibis.

Objectives

- Protect soils and wetlands using BMPs during forestry operations. (Depot-wide objective 12) (Objective number refers to Section 1.3, Table 1)
- Protect wetland and water quality using a variety of techniques such as stormwater retention/detention, buffer strips, and BMPs. (Depot-wide objective 13).

Long-Term Management

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 sediment and nutrients from surface water, which can result in deteriorated surface water quality.

MCRD Parris Island will continue to incorporate the Federal Government's policy of no net loss of wetlands. Protective buffer strips or corridors of designated widths will be maintained and/or developed around wetlands and along streams. Vegetative buffers between wetland and upland developed areas will help maintain and improve water quality by filtering sediments and other pollutants from runoff prior to discharge into the wetland. Vegetative buffers also will provide habitat

for a diversity of wetland and upland species. Width of the buffers will be determined by the following: Best Management Practices, edaphic characteristics (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. Restrictions within these buffers include activities such as heavy equipment operation, application of pesticides with acute toxicity to fauna, soil horizon disturbance, recreation trails (except those focusing on the wetlands), 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.

Wetland systems within the Depot provide valuable wildlife habitat, water quality protection and flood protection. However, because of various site constraints and the need for future development of lands, MCRD Parris Island will be required to balance the need to protect wetland resources with support of the military mission. Proper management of wetland areas is necessary to enjoy the benefits provided by wetlands and to comply with federal laws and regulations.

Projects and Strategies

Project 1: Wetlands Delineation

Strategy

The most recent wetland delineation is in need of updating because of the many changes that have taken place in federal law since the survey was completed.

Project 2: Wetland Enhancement

Strategy

MCRD Parris Island will enhance the existing wetlands by prescribed fire, removing trash and eliminating invasive exotic plants.

Project 3: Wetland Monitoring

Strategy

MCRD Parris Island will assess wetland function periodically as follows:

1. Keep records of area of wetlands created, restored, enhanced, drained or filled each year. This includes the area of pinewood ponds burned each year.

2. Evaluate tidal wetlands for water quality using the South Carolina Department of Health and Environmental Control (DHEC) sampling procedures.

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

- Federal Water Pollution Control Act, as amended by the CWA of 1977, 33 United States Code (USC) 1251, prohibits the discharge of dredged or fill materials into waters of the

United States, including wetlands, without first obtaining a permit from the USACE (Section 404 of the CWA).

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

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

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

- MCO 5090.2 Vol. 11 (030302) and OPNAVINST 5090.1D (12-3.8.b), discusses natural resources management relating to wetland management.

- South Carolina Code of Laws, Title 48, Chapter 39, Coastal Tidelands and Wetlands requires protection and responsible management of all areas defined as part of the coastal zone. Only the Coastal Zone Management Consistency applies to the MCRD; critical area permitting does not since the MCRD owns all of the tidal areas and salt marsh.

- South Carolina Scenic Rivers Act of 1989, allows the harvest of timber in wetland areas provided that Forestry Commission approved Best Management Practices (BMPs) are followed.

- South Carolina Pollution Control Act gives DHEC the authority to regulate the quality of surface and groundwater in SC.

Additional Sources of Information

- Technical Reports/Publications.

- Kusler, Jon A., and Mary E. Kentula. *Wetland Creation and Restoration: The Status of the Science*. Island Press, 1990.

- *Clean Water Action Plan: Restoring and Protecting America's Waters,* United States EPA and the USDA, October 1998.

- USFWS, Charleston Ecological Services Office: (843) 727-4707; USACE Charleston Regulatory Office: (843) 329-8044.

- EPA Regional Wetlands Chief: (404) 562-9132.

- NRCS Wetland Science: http://www.wli.nrcs.usda.gov/
- Environmental Law Institute: http://www.eli.org/index.cfm
- Depot for Marine Conservation:
- University of Florida, Center for Aquatic and Invasive Plants: Institute of Food and Agricultural Sciences: https://plants.ifas.ufl.edu/
- EPA Office of Water, Wetlands, Oceans, and Watersheds: https://www.epa.gov/aboutepa/about-office-water#wetlands

4.1.2 Floodplain Management

Floodplain management is the operation of an overall program of corrective and preventative measures for reducing flood damage. Floodplain management aims to achieve a reduction in the loss of life, disruption, and damage caused by floods; and the preservation and restoration of the natural resources and functions of floodplains. Floodplains perform important natural functions, including temporary storage of floodwaters, moderation of peak flows, maintenance of water quality, groundwater recharge, and erosion prevention. Also, floodplains provide habitat for wildlife, recreational opportunities, aesthetic benefits, and areas of archaeological significance.

Objectives

- Maintain the attenuation capacity of the remaining undisturbed acreage within the 100-year floodplain (Depot-wide objective #21).

Long-Term Management

Well over 90% of MCRD Parris Island is within the 100-year floodplain, and almost all of that acreage is already developed or otherwise constrained. Some streets are regularly covered with water during spring tides and heavy rain events. Consequently, all new construction will be within the 100-year floodplain. This construction will be designed to minimize exacerbation of flooding and to minimize damage that would occur when flooding occurs.

Projects and Strategies

Projects: None

Strategy

Design new development to minimize damage from flooding.

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

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

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

- 44 CFR Chapter 1, Subpart C, Section 60.22, contains suggestions for improving floodplain management to reduce the possibility of flooding;

- South Carolina Code of Laws, Title 48, Chapter 11 Watershed Conservation Districts, establishes watershed conservation districts and provides that SCDNR will assist with floodplain issues.

Additional Sources of Information

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

4.1.3 Soil Conservation and Erosion Control

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

Soil erosion contributes to water quality and conveyance problems, which may include:

- Elimination of habitat (terrestrial and aquatic);

- Reduction in reservoir capacity and stream flow; increased flooding potential;

- Degraded water quality;

- Increased maintenance time and costs associated with stormwater facilities (*e.g.,* culverts, ditches, and swales). At the Depot, erosion also threatens archaeological sites.

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

Human actions contributing to soil erosion on the Depot include:

- Human alterations to the natural vegetative cover and topography, including the channeling of water flow (*e.g.,* ditches) which increases the quantity and rate of flow; the exposure of soils

and increased soil slopes; and/or the creation of impervious surfaces;

- Forestry practices, including prescribed burns, thinning, and reforestation, exposing soils to rainfall, and stormwater runoff;
- Wave and wake action along the shoreline area of the Depot;
- Development in poor soil quality areas;
- Improper mowing and maintenance of grassed areas;
- Illegal driving of vehicles in wetlands and along beach shorelines;
- Sustained and excessive use leading to destruction of vegetation and eventual erosion.

Objectives

- Protect soils and wetlands using BMPs during forestry operations (Depot-wide objective 12).

Long-Term Management

The long-term management concept for soil conservation is to identify and understand the suitability and sustainability of a soil unit for a proposed action. USDA NRCS soil surveys have been reviewed to determine constraints on soil management units, and may also be used to determine appropriate management practices. The USDA soil survey for Beaufort County also provides information about potential erosion hazards; groundwater contamination; productivity of cultivated crops, trees, and grass; and the protection of water quality, wetlands, and wildlife habitat.

MCRD Parris Island will:

- Continue to use BMPs to control soil erosion for all natural resources operations. In addition, implement six principles for soil conservation and erosion management (Smoot and Smith, 1999).
- Minimize areas of disturbance by leaving intact stream buffers, forest conservation areas, wetlands, highly erodible soils, steep slopes, environmental features, and stormwater filtration areas.
- Stabilize and protect disturbed areas that are highly susceptible to erosion as soon as practicable.
- Minimize runoff velocities.
- Protect waterways and stabilize drainage ways that may be particularly susceptible to sedimentation.
- Retain sediment within construction sites.

- Reduce exposure time.
- Continue to use BMPs during all natural resources operations.
- Continue to evaluate and map erosion control problem areas on the Depot.
- Initiate projects to stop erosion at problem areas after consulting with the NRCS, USFWS and SCDNR.
- Continue to prohibit off-road vehicle use on the Depot to prevent erosion, compaction of soils, and destruction of wetlands and other habitats.

Projects and Strategies

Projects: None

Strategy

MCRD Parris Island will continue to implement soil conservation and erosion control practices per current SCDHEC standards, and maintain the Depot Order that prohibits off-road vehicle use in wetlands.

Tasks

1. Determine areas where soil type or past practices present threats of erosion.
2. Establish and implement BMPs to prevent soil erosion during all natural resources operations on the Depot.
3. Train and educate all contract and department personnel on actions that may directly or indirectly contribute to soil erosion, and measures that can be employed to avoid or lessen these conditions.
4. Utilize South Carolina Forestry Commission forestry BMPs to prevent erosion during forestry operations.

Laws, EOs, Regulations, Directives, and Memoranda Relevant to Soil Conservation

- Soil Conservation Act, 16 USC 590a et seq., provides for soil conservation practices on federal lands.
- Federal Water Pollution Control Act, as amended by the CWA of 1977, 33 USC 1251, regulates the dredging and filling of wetlands and establishes procedures for identifying and regulating non-point sources of polluted discharge, including turbidity, into waterways.
- EO's 11989 and 12608 close areas to off-road vehicles where soil, wildlife, or other natural resources may be adversely affected.
- EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic

organisms into natural ecosystems. Vegetative buffers and landscaping to control soil erosion must comply with this Executive Order.

- MCO 5090.2 Vol. 11 (030203) and OPNAVINST 5090.1D (12-3.8.d) discusses natural resources management relating to soil conservation management.

- Soil and Water Conservation Districts Law [SC ST SEC 48-9-10] establishes conservation districts, and directs the South Carolina Department of Natural Resources to create plans and guidelines to prevent erosion.

- Erosion and Sediment Reduction Act of 1983 directs the South Carolina DHEC to implement a statewide erosion and sediment reduction and stormwater management program.

Additional Sources of Information

- USDA NRCS, Beaufort County, South Carolina – (843) 522-8100;

- USDA NRCS: http://www.nrcs.usda.gov/

- Beaufort Office of the NRCS: http://www.sc.nrcs.usda.gov/contact/beaufort.html

- The National Erosion Research Laboratory: https://www.ars.usda.gov/midwest-area/west-lafayette-in/national-soil-erosion-research/

4.1.4 Stormwater and Water Quality Control

Stormwater runoff is precipitation that falls onto surfaces, such as roofs, streets, the ground, parking lots, sidewalks, etc., and is not absorbed or retained by that surface, but flows off, collecting volume and energy. Stormwater runoff management addresses measures to reduce flow energy and pollutants in stormwater, and to control discharge from point and 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.

Objectives

- Protect wetland and water quality using a variety of techniques such as stormwater retention/detention, buffer strips, and BMPs (Depot-wide objective 13).

Long-Term Management

MCRD Parris Island natural resources program will be guided by the following management concepts for stormwater runoff and water quality control:

- Continue to manage stormwater in natural areas consistent with BMPs described in the Water Quality Management Plan, to the extent practicable.

- Update the Water Quality Management Plan to include stormwater 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 Integrated 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 stormwater runoff from new development in order to protect adjacent natural areas.

- Assess alternatives to existing pesticides, herbicides, and fertilizers with the intent of protecting water quality.

Projects and Strategies

Projects: None

Strategy

Evaluate the stormwater management program and activities contributing to stormwater runoff and/or pollutant loading in stormwater runoff as it relates to the natural resources program.

Tasks

5. Continue to implement BMPs to minimize stormwater runoff during forestry operations.

6. Review construction projects as part of the Facility Engineering and Acquisition Division (FEAD) team to evaluate stormwater discharge into wetlands and waterbodies and ensure that:

    - Stormwater runoff is subjected to BMPs prior to discharging into wetlands and waterbodies. BMPs shall prevent or reduce the amount of pollution in water to a level compatible with South Carolina Surface Water Quality Standards.

    - No site activities result in violation of state water quality standards associated with the siltation of wetlands, or reduction in the natural retention or filtering capability of wetlands.

    - Adequate soil erosion measures are implemented.

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

- Federal Water Pollution Control Act, as amended by the CWA of 1977, 33 USC 1251, describes guidelines for the control of non-point source pollution;

- CZMA, 16 USC 1451 et seq., establishes authority (Section 6217) for states to administer coastal non-point source pollution programs when approved by the NOAA and EPA;

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

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

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

- OPNAVINST 5090.1D (12-3.8.f, 20-3.2), discusses natural resources management relating to non-point source pollution;

- OPNAVINST 5090.1D (39), establishes requirements, guidelines, and standards for the assessment of damages arising from the release of oil or hazardous substances;

- Stormwater Management and Sediment Reduction Act directs that no person may engage in a land-disturbing activity without first submitting a stormwater management and sediment control plan to the appropriate implementing agency and obtaining a permit to proceed and mandates that the South Carolina DHEC provide technical and other assistance to local governments in the control of stormwater runoff and sediment.

- MCRD Parris Island's Water Quality Management Plan covers stormwater and waste water activities on the Depot.

Additional Sources of Information

- EPA, Region 4, Regulatory Contact for stormwater permitting: Michael Mitchell, (404) 562-9303;

- EPA, Non-point Source: (404) 562-9390;

- SCDHEC, OCRM Charleston Office: (843) 953-0200;

- Environmental Law Institute: http://www.eli.org/index.cfm

- USGS Water Resources Home Page: https://www.usgs.gov/mission-areas/water-resources;

- EPA Office of Water, Wetlands, Oceans, and Watersheds: https://www.epa.gov/aboutepa/about-office-water#wetlands

4.1.5 Grounds Maintenance and Landscaping

Grounds maintenance is provided by contract and government personnel and is managed by MCRD Parris Island's PWD, MCCS, and by the Housing Area Contractor. Grounds maintenance

under these contracts, which include such services as grass cutting, edging, pruning, tree removal, mulching, fertilization, irrigation, planting, landscaping, and sodding impact natural resources.

Natural Resources program personnel will review and observe these practices to ensure implementation, to the maximum extent practical, of the objectives and management below. The NRM will also review and have input into the grounds maintenance and housing contracts when they are reviewed to be sure these contracts do not violate federal laws (i.e. ESA, MBTA, BGEPA), protect natural resources and to have the implementation of the contracts contribute to meeting the objectives of this plan.

Objective

- Implement beneficial landscaping and grounds maintenance practices to reduce erosion, prevent invasive species introduction into unimproved areas, and improve wildlife habitat (Depot-wide objective 17).

Long-Term Management

Landscaping

MCRD Parris Island's natural resources personnel will recommend and/or incorporate the principles of xeriscaping into grounds maintenance and landscaping activities. Xeriscaping uses native plants and drought tolerant/non-invasive exotics, which are typically better adapted to local climatic conditions and variations; more resistant to drought, disease, and pests; and require less water than nonnative species. Potential benefits of xeriscaping include reduced water use (typically 30 to 80 percent), decreased stormwater and irrigation runoff, fewer pesticide and fertilizer applications, less yard waste, increased habitat for native plants and animals, and lower labor and maintenance effort and thus costs. Xeriscaping will be utilized in new construction activities and will be phased into existing landscape areas as appropriate. Xeriscaping offers a viable alternative to the typically high-volume water requirements of other landscaping approaches by conserving water through creative landscaping.

Xeriscaping incorporates seven principles (Xeriscape Colorado Inc. 1999):

- Planning and design for water conservation and aesthetics;
- Creating practical turf areas using manageable sizes, shapes, and appropriate grass species;
- Selecting plants with low water requirements and grouping plants with similar water needs, then experimenting to determine how much and how often to water the plants;
- Using soil amendments, such as compost or manure, appropriate to site and plant needs;
- Using mulches such as wood chips to reduce evaporation and keep the soil cool;
- Irrigating efficiently with properly designed systems (including hose-end equipment) and by applying the right amount of water at the right time; and

- Maintaining the landscape by mowing, weeding, pruning, and fertilizing properly.

To integrate the principles of xeriscaping into existing landscaped areas, the Depot should evaluate regional initiatives and current landscaping practices and sites and to predict the effectiveness of xeriscaping toward improving existing conditions. MCRD Parris Island should evaluate whether the implementation of xeriscaping principles will: 1) provide sufficient benefits to justify any additional cost; 2) achieve the desired results; or 3) continue to achieve desired results. The success of integrating the xeriscaping principles into existing landscaped areas should be monitored and adjustments to management practices will be made, as necessary.

To maximize benefits for wildlife in urban areas, MCRD Parris Island's Natural Resources Branch will recommend and/or use the following guidelines during landscaping, as long as these benefits will not interfere with the military mission.

- Properties will be framed with a backdrop of native trees, which will simulate a forest canopy and provide nesting sites, protective cover, and food for small mammals and birds. Deciduous trees will be planted on the west side of buildings for summer shade.

- Lawn areas will be surrounded with trees.

- Trees and shrubs will be mulched with leaf litter, lawn clippings, tree trimmings, or wood chips. Mulches are a rich food source for ground foragers like towhees and thrushes; provide cover for small mammals, reptiles, and amphibians; also enrich the soil.

- Exotic plant species will be replaced with native species.

- Birds prefer unclipped, informal hedges, so old-growth will be selectively cut to assure that the plants do not overcrowd one another. Pruning will be avoided during the nesting season. Early flowering shrubs that bloom from buds formed during the previous summer will be selectively pruned or cut back only every few years.

- Orchard and flowering trees will be located to receive full sun. The use of toxic sprays will be avoided. Instead, fruit varieties that thrive without pesticides will be planted.

- Seedlings beneath large trees will be controlled, but a few young replacements will be left. The planting of evergreens such as red cedar (*Juniperus virginiana* and *J. silicicola*), wax myrtle, pines (*Pinus elliottii* and *P. taeda*), and hollies (*Ilex* sp.) will be considered to provide sound barriers from roads and other land uses. In the planting of all tree and shrub species consideration will be given to the ability of the species to provide food for wildlife and habitat for targeted bird species (*e.g.,* loggerhead shrike [*Lanius ludovicianus*], painted bunting).

Grounds Maintenance

The natural resources program at MCRD Parris Island will recommend the following ground maintenance guidelines:

- Avoid excessive mowing. Grass mowing should be scheduled on the basis of height, rather than by arbitrarily specified time intervals, if practicable.

- Natural resources personnel will review ground maintenance contracts prior to renewal.
- Mulch around trees and shrubs, where applicable, to avoid potential girdling and root zone compaction from hand trimmers and mowers.

Projects and Strategies

Project 4: Initiate Study to Eliminate Invasive Exotics in Maintained Areas

Initiate study of maintained areas to determine which ornamental plantings are invasive exotics and develop a plan to eliminate or contain the problem plants. As part of this study, evaluate the potential to replace the tamarix (*Tamarix* sp.) along roads with sea oxeye, salt meadow cordgrass, hairawn muhly, gulfhairawn muhly, and other low growing native species appropriate for the soil and salt conditions at these locations. This will eliminate any invasive species while lowering maintenance costs and improving the many vistas on MCRD Parris Island.

Strategy

MCRD Parris Island natural resources program will recommend grounds maintenance and landscaping practices consistent with the concepts presented in this INRMP.

Laws, EOs, Regulations, Directives, and Memoranda Relevant to Landscaping

- The President's April 16, 1994, Memorandum on Environmentally Beneficial Landscaping, requires implementing landscaping practices that are intended to benefit the environment and generate long-term cost savings;
- EO 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems;
- Federal Insecticide, Fungicide, and Rodenticide Act, 7 USC 136, governs the use and application of pesticides in natural resources management programs;
- Federal Water Pollution Control Act as amended by the Clean Water Act of 1977, 33 USC 1251, prohibits the discharge of dredged or fill materials into waters of the United States, including wetlands, without first obtaining a permit from USACE (Section 404 of the CWA);
- OPNAVINST 5090.1D (12-3.8.e), discusses natural resources management relating to environmentally and economically beneficial landscaping.

Additional Sources of Information

- Beaufort County Clemson Extension Office: (843) 470-5109;
- Native Plant Nursery Directory: http://www.plantnative.org/national_nursery_dir_main.htm
- Xeriscaping: http://www.xeriscape.org

- South Carolina Native Plant Society: http://www.scnps.org/
- Clemson Extension Home & Garden Information Center: http://hgic.clemson.edu/
- Beaufort County Cooperative Extension Service: http://www.clemson.edu/beaufort/
- Water Wiser (program of the American Water Works Association - operates in cooperation with EPA and US Bureau of Reclamation): http://www.waterwiser.org

4.1.6 Invasive, Exotic and Noxious Species

Objectives

- Control invasive species throughout the Depot (Depot-wide objective 2);
- Maintain habitats with diverse native plant and animal populations (Depot-wide objective 18).

Long-Term Management

Invasive and exotic species will be managed through the removal of the species and restrictions on the introduction of the species to the Depot in accordance with EO 13112. MCRD Parris Island will continue to monitor the extent of invasive and exotic species on all properties and continue invasive and exotic species control. In addition, the NRM will screen all lists of landscaping plants proposed for planting to ensure invasive and exotic species are not used.

The use of pesticides/herbicides for removal of invasive and exotic species and pests will be conducted in accordance with federal and state laws, and Navy/Marine Corps regulations controlling the use of pesticides. According to the EPA, a "pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Pests can be insects, mice and other animals, unwanted plants (weeds), fungi, or microorganisms like bacteria and viruses; the term pesticide also applies to herbicides, fungicides, and various other substances used to control pests" (http://www.epa.gov/pesticides/about/). Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 USC 136, pesticides are registered at the federal level and by individual states. Therefore, a particular pesticide product that is federally registered by the EPA is not legal for use until it is also registered by the individual state. FIFRA allows individual state registrations to be more restrictive than federal registrations, but not less so. Additionally, the USMC is required to follow Navy regulations with respect to pest management ().

To ensure that the application of pesticides does not contaminate surface waters and/or inadvertently affect flora or fauna, pesticides will be applied by skilled, DOD-certified workers or SC state certified applicators, and according to label instructions. Careful prescription of the type and amount of chemical to be applied and the use of buffer areas around surface waters will also help prevent misdirected application or deposition. The Depot will also consider the applicability of non-pesticide removal methods.

Projects and Strategies

Project 5: Invasive and Exotic Species Control

Strategy:

MCRD Parris Island will continue to implement its invasive and exotic plant control plan as recommended by Clemson University, IPM or NRM.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Invasive Species

- Federal Noxious Weed Act of 1974, 7 USC 2801 et. seq., provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce.
- Executive Order 13112, 3 February 1999, requires executive agencies to restrict the introduction of exotic organisms into natural ecosystems.
- Federal Insecticide, Fungicide, and Rodenticide Act, 7 USC 136, requires that all pesticides, whether for commercial or private use, be applied in accordance with product labeling and that containers are properly disposed of. EPA is responsible under FIFRA for the registration of all pesticide active ingredients used in the United States.
- OPNAVINST 6240.4B, 27 August 1998, Pest Management Programs, provides the DON with policies for implementing pest management programs directed against pests that conflict with or adversely affect the mission of the DOD; affect the health and well-being of the DON personnel and their dependents; attack or damage real property, supplies, or equipment; adversely affect the environment; or are otherwise undesirable.
- Federal Plant Pest Act, 7 USC 150a et seq., regulates the importation and interstate movement of plant pests and authorizes the Secretary of Agriculture to take emergency measures to destroy infected plants or materials.
- MCO 5090.2 Vol. 11 (030202) and OPNAVINST 5090.1D (12-3.8.g, 12-3.10, 12-5.33), discusses natural resources management relating to the control of noxious weeds.
- South Carolina Code of Laws, Title 46, Chapter 23 Noxious Weeds, establishes control and eradication of noxious weeds and regulates them in interstate and foreign commerce.
- South Carolina Code of Laws, Title 49, Chapter 6 Aquatic Plant Management, creates a program for the purpose of preventing, identifying, investigating, managing, and monitoring aquatic plant problems in public waters of South Carolina.

Additional Sources of Information

- TNC, South Carolina Office: (803) 254-9049;
- Applied Biology & Pest Management, Naval Facilities Engineering Systems Command

(NAVFAC): (619) 532-1157;

- Florida Department of Agriculture and Consumer Services, Pesticide Division: (850) 617-7900;
- The Nature Conservancy's Weed Information Management System: https://tncinvasives.ucdavis.edu/wims.html
- South Carolina Exotic Pest Plant Council: http://www.se-eppc.org/southcarolina/
- University of Florida, Center for Aquatic and Invasive Plants: https://plants.ifas.ufl.edu/
- USFWS Invasive Species Program: https://www.fws.gov/invasives/USDA National Invasive Species Information Center: https://www.invasivespeciesinfo.gov/USDA Plants Database: https://plants.usda.gov/java/
- Center for Invasive Species and Ecosystem Health: https://www.invasive.org/index.cfm

4.2 FOREST MANAGEMENT

MCRD Parris Island will manage its limited forest to support mission training, provide forest products, enhance wildlife habitat, and maintain aesthetics using ecosystem management concepts to guide management decisions. The limited acreage, restricted access, extensive wetlands, and smoke concerns limit management both from forest product and ecosystem viewpoints.

Approximately 1,200 acres of land are being managed as forestland at MCRD Parris Island; however, only about 500 of those acres are ever likely to be regenerated. The remaining acres are either intensively used for training or are in a situation (Hammock Island, highly visible buffers, dominated by live oak, etc.) that makes regeneration and, for the hammock islands and buffers, even thinnings unlikely. To provide some early successional habitat and provide forest products, the forestry program will plan on regenerating about 50 acres every 10 years. Usually, this will be accomplished via small patch clearcuts (less than 15 acres) in larger thinnings. Since these patches will have a tendency to be overstocked, they will be pre-commercially thinned by either fire or mechanical means. If this does not create patches with early successional species, management will be adjusted keeping in mind the other aspects of the natural resources and Marine Corps training programs.

4.2.1 Objectives

- Prescribe burn pine and pine/hardwood stands while trying to mimic natural fire regimes (Depot-wide objective 1);
- On most available land, produce a sustained yield of commercial timber products from native species in a manner consistent with ecosystem management (Depot-wide object 16);
- Maintain lands in a manner that best supports Depot training needs through frequent feedback with the training command (Page Field objective 1).

4.2.2 Long-Term Management

The foresters at NAVFAC SE provide on-the-ground professional forest management services for the Depot on a cost reimbursable basis. The FEAD awards and maintains records on forestry contracts.

Forest stands at MCRD Parris Island are managed with an ecosystem approach for sustained yield and health. Planned silvicultural activities for this 10-year period include thinning and prescribed burning with clear cuts limited to 100 acres over the next 10 years. These clearcuts will be spaced out and be as small as feasible to allow natural regeneration from nearby stands. If too many seedlings are established in a clearcut stand, it may be pre-commercially thinned by fire, mechanical, or chemical means. Other cuts may be required to provide training areas or building sites as necessary to support the military mission. Other forest management activities such as fire suppression and control of insects may be required to protect the forest and other property. Firebreaks are a necessary part of a fire management program. Existing features such as roads and streams may be used as firebreaks, but often such features are not present. Where existing features do not occur, man-made firebreaks must be established and maintained.

Firebreaks are established prior to prescribed burning or in areas that will not be burned during a given year; firebreaks may be necessary to establish and maintain as a protection against spread of wildfires. Plowed firebreaks will be disked and leveled to prevent soil erosion and interruption of boundaries and hydrology. Permanent firebreaks may later be used for forest access. Almost all firebreaks at MCRD Parris Island will be roads or ditches.

Unplanned activities that will require a change to the plan of work in forest areas may result due to natural causes or mission related requirements. Natural causes include the effects of wildfire, insect and disease outbreaks, nuisance animal damage, and weather-related events such as tornadoes, tropical storms, or hurricanes. Implementing a tree hazard assessment (THA) both before and after a storm event will identify, analyze, and evaluate tree risk on the Depot. The Depot completed a THA SOP in 2019 that recommends BMPs to identify tree risks in order to mitigate risk to recruit training, structures, utilities and personnel, and minimize unnecessary tree removal.

Mission related requirements may include such actions as clearcutting of forest areas and subsequent deletion of areas from the forest management program for new facilities. Mission related changes may also require increased thinnings or other forest cuttings that allow the area to remain in forestry but will necessitate an interruption in the rotation requiring site preparation and reforestation.

Projects

Project 6: Forest Product Sales

Project 7: Fire Management

Project 8: Forest Protection

Project 9: Forest Inventory

Project 10: Timber Stand Improvement

Strategy

Utilize forest management techniques to promote training, enhance wildlife habitat, provide an aesthetically pleasing appearance, and provide marketable products.

4.2.3 Laws, EOs, Regulations, Directives, and Memoranda Relevant to Forest Management Activities

- Federal Noxious Weed Act of 1974, 7 USC 2801, establishes control and eradication of noxious weeds and regulates them in interstate and foreign commerce.
- Executive Order 13112, Invasive Species, as previously described.
- DOD Publication 7000.14-R, Volume 11A, Chapter 16, administers the reimbursement of costs of managing forest resources for timber production. Under this regulation, only expenses related to the maintenance of timber for commercial sale are reimbursed.
- MCO 5090.2 Vol. 11 (030206) and OPNAVINST 5090.1D (12-3.8.j), discusses laws that govern natural resources management relating to the protection and management of forest resources.
- Sikes Act, 16 USC 670 (a)-(o), authorizes conservation programs on military installations.
- DOD Directive 4715.1E establishes the Defense Environmental Security Council; the Environment, Safety, and Occupational Health Policy Board and the Defense Environmental Security Council Committee structure; and the Armed Forces Pest Management Board.

4.2.4 Additional Sources of Information

- Technical Reports/Publications.
- Farrar, R.M. Jr. 1996. Fundamentals of Uneven-Aged Management in Southern Pine. Tall Timbers Research Depot: https://talltimbers.org/information-resources-publications/
- *A Guide for Prescribed Fire in Southern Forests*. 1989. USDA Forest Service, Southern Region. Technical Pub. R8-TP 11.

- Tall Timbers Research Depot: (850) 893-4153.
- The Nature Conservancy Fire Management Manual: https://www.tncfiremanual.org/require.htm
- South Carolina Forestry Commission: http://www.state.sc.us/forest/

South Carolina Forestry Commission BMPs: http://www.state.sc.us/forest/refbmp.htm

- SCDNR: https://www.dnr.sc.gov/ University of Florida Land Steward: http://www.sfrc.ufl.edu/Extension/florida_forestry_information/index.html
- American Forests: (202) 737-1944, https://www.americanforests.org/
- National Association of State Foresters: http://www.stateforesters.org/
- Society of American Foresters: (301) 897-8720, http://www.safnet.org/
- USDA Forest Service: https://www.fs.usda.gov/
- Sustainable Communities Online, Treelink: https://www.sustainable.org/economy/forestry-a-wood-products/372-treelink

4.3 FISH AND WILDLIFE

Fish and wildlife management actions are designed to conserve, enhance, and regulate habitat for game and non-game indigenous wildlife species. The Depot completed a Wildlife Protection SOP in 2013 (updated in 2022) that provides guidelines for personnel, staff, and visitors to ensure their safety and the protection of wildlife and critical habitats.

This section addresses the following:

- wildlife management;
- threatened and endangered species and natural communities;
- game management;
- prevention and control of wildlife damage and disease, and
- fisheries management.

4.3.1 Wildlife Management

In this plan, wildlife management involves the implementation of management practices to manipulate wildlife habitat to diversify existing wildlife populations by increasing the less common species.

Growth and development on and surrounding the Depot will require thoughtful implementation of these practices to conserve and enhance terrestrial, aquatic, and avian wildlife populations on MCRD Parris Island and in the region.

Objectives

- Maintain populations of all animals appropriate for the local area, habitats, and size of the Depot; maintain average or better populations for species determined to be declining in the region (Depot-wide objective 8);
- Monitor the deer herd through collection of information from harvested deer supplemented with other studies as recommended by the state (Depot-wide objective 9);
- Utilize bird and bat houses to increase populations of mosquito-eating birds and bats (Depot-wide objective 11);
- Maintain a low enough deer population, through hunting, to support increased biodiversity of other species, reduce or eliminate deer/auto collisions, and reduce tick populations (Depot-wide objective 14);
- Conduct bird surveys to evaluate training impacts on migratory birds (Page Field objective 2).

Long-Term Management

Wildlife habitats will be managed to sustain wildlife resources on the Depot consistent with the military mission. Given the small size of the Depot, the most valuable resources are the maritime/upland hardwood forest, the Depot's wetlands, and the heron nesting area in the northeast corner of the Depot. These areas will be protected from development and training damage as much as practical.

In general, the Depot will manage wildlife to provide a resource for hunting and nature observation, maintain ecosystem components and processes, and complement ongoing programs at the federal, state, and local level.

Terrestrial Wildlife Management

- Preserve and regenerate hardwoods during Timber Stand Improvement and Wildlife Stand Improvement activities on the Depot to provide mast (*e.g.,* acorns, hickory, nuts, pecans, and various berries).
- Avoid habitat fragmentation. Arbitrarily locating human-made structures within wildlife areas undermines ecological processes by separating wildlife populations and may render the fragmented parcel unsustainable for wildlife.
- Maintain forest stands with 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 foraging efficiency. The thinning and burning will be sufficient to allow production of a good mixed grass / herbaceous layer throughout pine stands over 30 years of age.

- Continue a nesting assistance program on the Depot. This effort involves retaining snags (dead trees) within managed forests for use by woodpeckers, owls, squirrels, bluebirds, bats and other cavity dwelling species, and the placement of artificial nesting structures where needed. Maintain 40 blue bird nest boxes and 20 osprey nesting platforms to ensure their use and functionality as per the 2013 (updated in 2022) Wildlife Monitoring SOP. 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.

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

Migratory Bird Management

Migratory birds are protected under the 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; however, under recent amendments to the act, that protection does not extend to military training. 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.

Partners in Flight (PIF) is an international organization of various federal, state, local, and independent agencies that was launched in 1990 in response to growing concerns about declines in the populations of many land bird species in order to emphasize the conservation of birds not covered by existing conservation initiatives. The DOD is one of the many federal agencies that signed a Memorandum of Agreement supporting the conservation of birds through the PIF initiative.

PIF has developed a Landbird Conservation Plan (PIF 2016) for the U.S. and Canada with regional objectives for each physiographic area in the U.S. The Bird Conservation Region for the Atlantic Coast applies to MCRD Parris Island (PIF 2016). MCRD Parris Island will implement long-term migratory bird management practices in support of PIF and the Landbird Conservation Plan while ensuring the Depot's military mission. The following practices will be implemented for migratory bird management:

- Annual monitoring for migratory birds with emphasis on MBTA-protected species and South Carolina's State Wildlife Action Plan (SCDNR 2015) priority species to determine population trends in association with habitat management. The highest priority bird species are bald

eagle, painted bunting, saltmarsh sparrow, brown-headed nuthatch, shorebirds, and colonial nesting waterbirds. If funding is available, point counts and other surveys for most bird species will be conducted to collect information on all priority species. This should be about 60 points each year in late May or early June, searches for winter sparrows and shorebirds during the winter, and surveys of colonial nesting waterbirds in the summer and winter.

- Continue monitoring of the bald eagles now that they have been delisted.

- Develop other management strategies for high priority species as management techniques are developed as part of a migratory bird management plan. A Bald Eagle Management Plan was developed in 2008 by USFWS and is available in Appendix VI.

The MBTA exemption, published in the federal register at 50 CFR Part 21, directs and encourages the DOD to manage migratory birds to reduce adverse impacts that any incidental take may have on bird species. The rule, EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), and the Memorandum of Understanding (MOU) to Promote the Conservation of Migratory Birds between the DOD and the USFWS pursuant to EO 13186 direct the DOD to incorporate conservation measures addressed in regional or state bird conservation plans in the INRMP development process. The PIF (2016) Landbird Conservation Plan provides a list of species of continental importance specific to the Atlantic Coast region, which applies to the MCRD Parris Island.

For non-military readiness activities, migratory birds at MCRD Parris Island will be protected under the MBTA against "takings." Under the MBTA, takings 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 constitute a taking; neither does nest removal outside nesting season. The Depot's NRM will be informed before any action is taken that may affect any migratory bird species. The NRM 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.

South Carolina's State Wildlife Action Plan

South Carolina's 2015 State Wildlife Action Plan (SCDNR 2015) is designed to manage all non-game wildlife to stop ongoing declines in many species. While this plan is for the whole state, many of the species and habitats affected by the plan occur on MCRD Parris Island. Where management of these species and habitats as provided for in the plan does not conflict with MCRD Parris Island's mission, this INRMP is designed to help South Carolina meet plan goals by targeting management of those species and habitats identified in the plan.

Specifically, MCRD Parris Island plans on managing for such species as the painted bunting, northern bobwhite (*Colinus virginianus*), and loggerhead shrike, as well as for habitats such as maritime forest, marsh edge (shrub/scrub land), and tidal lands so vital to many species. MCRD Parris Island can help in four of the nine Conservation Action Areas identified in the plan. These are Habitat Protection, Control of Invasive and Nonnative Species, Public Land Management, and Survey and Research Needs.

Projects and Strategies

Project 11: Non-game Management

Strategy

Conduct habitat improvement actions for a variety of species, especially those protected by the MBTA and species identified in South Carolina's State Wildlife Action Plan (SCDNR 2015).

Project 12: Migratory Bird Surveys.

Strategy

MCRD Parris Island will continue to monitor migratory birds annually by completing surveys during the breeding season with an emphasis on painted buntings and winter surveys for short distance migrants and shorebirds. Per the 2013 Wildlife Monitoring SOP, birds are closely monitored to ensure their safety and habitats are maintained due to the nature of the training activities taking place on the Island.

Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Wildlife Management

- Sikes Act, as amended 16 USC 670a-o, requires each military department to manage fish and wildlife resources in accordance with a tripartite cooperative plan agreed to by the USFWS and state wildlife agency, to provide its personnel with professional training in fish and wildlife management.

- MBTA, as amended 16 USC 703-712, prohibits the taking or harming of a migratory bird, its eggs, nests, or young without the appropriate permit.

- Fish and Wildlife Conservation Act, 16 USC 2901, encourages all federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable and consistent with each agency's statutory responsibilities, to conserve and promote conservation of non-game fish and wildlife and their habitats.

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

- Federal Noxious Weed Act of 1974, 7 USC 2801 et seq., provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce.

- Federal Insecticide, Fungicide, and Rodenticide Act, 7 USC 136, requires that all pesticides, whether for commercial or private use, be applied in accordance with product labeling and that containers are properly disposed of. EPA is responsible under FIFRA for the registration of all pesticide active ingredients used in the United States.

- MMPA of 1972, 16 USC 1361-1407, prohibits the taking or harming of marine mammals without the appropriate permit.

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

- MCO 5090.2 Vol. 11 (0304) and OPNAVINST 5090.1D (12-5.24), discusses laws that govern natural resources management relating to the protection and management of fish and wildlife resources.

- South Carolina Statutes, Chapter 372, covers wildlife management.

Additional Sources of Information

- SCDNR, Wildlife and Freshwater Fisheries Division: (803) 734-3886;

- DOD PIF : http://www.dodpif.org/index.php

- South Carolina Comprehensive Wildlife Management Plan: https://www.dnr.sc.gov/cwcs/

- North American Bird Conservation Initiative: https://nabci-us.org/Atlantic Coast Joint Venture: https://acjv.org/ USFWS Migratory Bird Program: https://www.fws.gov/birds/

4.3.2 Threatened and Endangered Species and Natural Communities

Based on scientific and commercial data, species are listed as endangered or threatened if there is a 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. Additionally, the South Carolina Endangered and Threatened Species Act provides protection to species not listed under the federal act.

Federally or state-listed animal species that occur or may occur on MCRD Parris Island (see Section 3.10) have been identified as conservation priorities and require special protection efforts.

Objectives

- Maintain populations of all animals appropriate for the local area, habitats, and size of the Depot; maintain average or better populations for species determined to be declining in the region (Depot-wide objective 8);

- Monitor, maintain, and provide a conservation benefit for endangered and threatened species on the Depot (Depot-wide objective 10).

Long-Term Management

MCRD Parris Island will actively manage areas for the species discussed below, but will also manage for other federally or state-listed threatened or endangered species as conditions warrant. Several listed threatened or endangered species have been identified as conservation priorities. Changes in management practices may result from: 1) the listing of a new species for protective status or the removal of a species; or 2) a change in the species found to occur on the Depot. MCRD Parris Island will continue to conduct 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 NRM in consultation with NAVFAC foresters and biologists, as well as appropriate federal and state agencies. MCRD Parris Island SOPs for Wildlife Monitoring and Wildlife Protection were both completed in 2013 and are incorporated herein.

Northern Long-Eared Bat (Myotis septentrionalis)

- Status: Threatened - Federal.

- Management: Identify and protect habitat for bats. Where possible and not a safety hazard, leave dead or dying trees. Mature bottomland hardwood forests should be protected and forested corridors need to be maintained as well. Bats should be discouraged from using buildings occupied by humans. Install and maintain bat boxes and erect or replace as needed in suitable habitat where cavity trees are limited.

- A memorandum from the Navy Region Mid-Atlantic regarding tree clearing restrictions for the northern long-eared bat (NLEB) is provided in Appendix XI. This memorandum updates previous informal guidance regarding tree clearing restrictions necessitated by the possible presence of the NLEB. This updated guidance clarifies that the existing time of year restriction (tree clearing prohibited 1 June – 31 July) only applies to the clearing of trees within .25-mile from known NLEB hibernacula or within 150 feet from known NLEB maternal roost trees. Tree clearing activities that fall outside the specifications above are compliant with the ESA as long as the informal consultation process is completed (see Appendix XI for further details).

Rafinesque's Big-Eared Bat (Corynorhinus rafinesquii)

- Status: Endangered – State.

- 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.

- Install and maintain bat boxes and erect or replace as needed in suitable habitat where cavity trees are limited.

West Indian Manatee (Trichechus manatus)

- Status: Threatened - Federal and Endangered – State Management: Other than awareness, such as being mindful of manatees while boating in the Depot's adjacent waters and minimizing human interactions, no special management is needed at this time.

Bald Eagle (Haliaeetus leucocephalus)

- Status: Threatened - State;
- Management: A Bald Eagle Management Plan was developed in 2007 by USFWS and is available in Appendix VI. Manage, protect and monitor active nest sites. Monitor the Depot for any new nest sites.

Least Tern (Sterna antillarum)

- Status: Threatened - State.
- Habitat Use and Requirements: Least terns prefer vegetation-free sand or gravel islands for nesting, although beaches may also be used. Least terns prefer areas remote from trees or other vegetation that may hide or support predators. Least terns are primarily piscivores (fish-eaters), and feed opportunistically on small fish species or the young of larger fish species, foraging for fish in shallow water habitats. The least terns' fall migration generally follows major river basins to their confluence with the Mississippi River and then south to the Gulf of Mexico.
- Habitat Conditions: Least terns are likely considered transient individuals, not using the Depot for breeding, but rather for limited foraging activities in the adjacent waters.
- Limiting Factors: Much of their natural habitat has been lost because of broad-scale changes to natural river systems that include invasive plants, dams and reservoirs, river channelization, bank stabilization, hydropower generation, and water diversion.
- Current Status: The least tern has been observed feeding in the waters on and around the Depot, but no documented breeding.
- Management: Other than controlling human access to sandy areas and limiting construction activities in these areas, no special management is needed at this time. Monitor suitable areas for nesting activity.

Piping Plover (Charadrius melodus)

- Status: Threatened - Federal;
- Management: Other than controlling human access to sandy areas and limiting construction activities in these areas, no special management is needed at this time.

Red Knot (Calidris canutus rufa)

- Status: Threatened - Federal;
- Management: Other than controlling human access to sandy areas and limiting construction activities in these areas, no special management is needed at this time.

Wilson's Plover (Charadrius wilsonia)

- Status: Threatened - State;
- Management: Other than controlling human access to sandy areas and limiting construction activities in these areas, no special management is needed at this time.

Wood Stork (Mycteria americana)

- Status: Endangered - State and Federal.
- Management: Maintain existing wetlands. Investigate the feasibility of managing the currently tidal borrow pits for wood stork feeding habitat.

Projects and Strategies

Project 13: Rare, Threatened and Endangered Species Surveys.

Strategy

MCRD Parris Island will monitor listed species on Depot property as described in the 2013 Wildlife Monitoring SOP and in Section 5.0.

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

- ESA, 16 USC 1531-1543, Title 50 CFR Part 17, provides for the identification and protection of threatened and endangered species of fish, wildlife, and plants and their critical habitats. Requires federal agencies to ensure that no agency action is likely to jeopardize the continued existence of a threatened or endangered species.
- MBTA, as amended 16 USC 703-712, prohibits the taking or harming of a migratory bird, its eggs, nests, or young without the appropriate permit.
- Sikes Act, as amended 16 USC 670a-f, requires each military department to manage fish and wildlife resources in accordance with a tripartite cooperative plan agreed to by the USFWS and state wildlife agency, to provide its personnel with professional training in fish and wildlife management.
- MMPA of 1972, 16 USC 1361-1407, prohibits the taking or harming of marine mammals without the appropriate permit.
- Fish and Wildlife Conservation Act, 16 USC 2901, encourages all federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent

practicable and consistent with each agency's statutory responsibilities, to conserve and promote conservation of non-game fish and wildlife and their habitats.

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

- MCO 5090.2 Vol. 11 (0304) and OPNAVINST 5090.1D (12-3.7, 35-3.21), discusses laws that govern natural resources management relating to the protection and management of fish and wildlife resources.

- South Carolina Statutes, Chapter 372, protects wildlife species listed as endangered, threatened, or species of concern by the state of South Carolina.

Additional Sources of Information

- USFWS Charleston Ecological Services Office: (843) 727-4707;

- South Carolina Heritage Trust Program: https://www2.dnr.sc.gov/ManagedLands/ManagedLand/Preserve
- USFWS Endangered Species: https://www.fws.gov/endangered/
- South Carolina Department of Natural Resources: https://www.dnr.sc.gov/

4.3.3 Game Management

Deer hunting is currently allowed on the Depot to keep the herd in balance with available food, reduce deer/auto collisions, and control tick populations. MCRD Parris Island Depot Controlled Deer Hunt SOP contains Depot hunting regulations. All hunting activities are conducted in accordance with federal, Depot and state laws and regulations. These laws are enforced on the Depot by the Depot CLEO. Additional detail on the controlled deer hunts can be found in the 2013 Controlled Deer Hunt SOP (Appendix V). Game management in the context of this plan includes established techniques, which benefit a variety of wildlife including both game and non-game species. MCRD Parris Island will utilize effective management and monitoring techniques to sustain essential habitat and populations of game species in areas consistent with the military mission.

Objectives

- Provide fish- and wildlife-based outdoor recreation, including hunting, appropriate to the present resource base and compatible with military use of the Depot (Depot-side objective 4);

- Monitor the deer herd through collection of information from harvested deer supplemented with other studies as recommended by the state (Depot-wide objective 9);

- Conduct deer surveys to monitor deer as determined on site in consultation with the SCDNR biologist;

- Maintain a low enough deer population, through hunting, to support increased biodiversity of other species, reduce or eliminate deer/auto collisions, and reduce tick populations (Depot-

wide objective 14).

Long-Term Management

White-Tailed Deer Management

MCRD Parris Island will continue to improve herd condition, maintain deer populations at acceptable levels (SCDNR recommended 1 deer per 10 acres of habitat), 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 while emphasizing the harvest of adult doe.

Deer herd management will consist primarily of habitat enhancement and harvest quotas. Deer harvest data is compiled after each hunt and will be kept to monitor the condition of the herd. SCDNR deer biologists will analyze the previous year's harvest data and make specific recommendations for the number of deer to be harvested during the next hunting season.

Habitat enhancement will be accomplished through timber management practices.

Prescribed burning of selected areas, on a 2-to-3-year rotation, will be emphasized since this is the most effective and economical means of improving deer habitat. Forest openings, created by power line rights-of-way, roads, magazine areas, and wildlife food plots 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 staff are available. Overall, the emphasis will be on maintaining a SCDNR recommended, but healthy deer population.

Northern Bobwhite Management

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, but not exactly, to those identified above for deer. An open overstory 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.

Bobwhite are not hunted on MCRD Parris Island. Current populations are zero. In fact, only one has been detected on the Depot since 2007 and reintroduction may be needed.

Project 14: Manage Small Game.

Strategy

Manage small game habitat by prescribed fire and timber management that provides habitat for small game in an ecosystem management setting. Utilize other small game practices (brush piles, food plots, nest boxes, etc.) as time, funding, and volunteer help permit.

Project 15: Manage Deer

Strategy

Conduct habitat improvements, allow hunting to the extent that the species can sustain the take, and monitor the deer herd.

Additional Sources of Information

- SCDNR Deer Project Supervisor – Charles Ruth – contact info: SCDNR Deer Project, P. O. Box 167, Columbia, SC 29202-0167, Phone: 803-734-3886, E-mail: RuthC@dnr.sc.gov; Webb Wildlife Management Area – April Atkinson, 1282 Webb Ave, Garnett, South Carolina 29922, 803-625-3569, atkinsona@dnr.sc.gov
- SCDNR: http://www.dnr.sc.gov/
- Northern Bobwhite Conservation Initiative: http://www.bobwhiteconservation.org/
- Quail Unlimited: http://www.qu.org/
- National Wild Turkey Federation: http://www.nwtf.org/

4.3.4 Prevention and Control of Wildlife Damage and Disease

The prevention and control of wildlife damage are actions to reduce wildlife conflicts with people or other wildlife species. One issue of concern is the presence of venomous snakes in areas with intense recruit training. Currently, venomous snakes (eastern diamondback rattlesnakes are the only venomous species on the Depot currently) are captured by the NR staff and Marshall University researchers when found in training or other highly utilized areas. The relocated snakes may be returning to their capture location and may still present a problem. As training activities increase, so would the probability of increased exposure of military personnel and recruits to venomous snake habitat, specifically the eastern diamondback rattlesnake. Monitoring data collected between 2008 and present indicate that the rattlesnakes restrict their activity to areas with low human activity and actively avoid areas that increase their exposure to risks. Continued data collection allows populations to be monitored and preventative measures to be taken as needed to reduce human- rattlesnake encounters.

Additionally, coyotes, raccoons, gray squirrels, feral cats, and bats are known to occur on the Depot and may be considered nuisance individuals under certain circumstances. Some birds, such as house sparrows, starlings, pigeons, barn swallows, grackles, woodpeckers, and crows may also be

considered nuisance wildlife in some instances. Artificially high populations of raccoons and any feral cats result in increased mortality to migratory birds, reptiles, amphibians, and small mammals.

Prevention and control of wildlife disease addresses diseases transferred between wildlife species and/or diseases transferred directly or indirectly from wildlife species to humans.

Diseases of wildlife can cause illness and death to individual animals and can significantly affect wildlife populations. Wildlife species can also serve as natural hosts for diseases that affect humans (zoonoses). The disease agents or parasites that cause these zoonotic diseases can be contracted from wildlife directly by bites or contamination or indirectly through the bite of arthropod vectors such as mosquitoes, ticks, fleas, and mites (McLean 1994).

Objectives

- Control invasive species throughout the Depot (Depot-wide objective 2);
- Maintain populations of all animals appropriate for the local area, habitats, and size of the Depot; maintain average or better populations for species determined to be declining in the region (Depot-wide objective 8);
- Maintain a low enough deer population, through hunting, to support increased biodiversity of other species, reduce or eliminate deer/auto collisions, and reduce tick populations (Depot-wide objective 14);
- Maintain habitats with diverse native plant and animal populations (Depot-wide objective 18);
- Maintain lands in a manner that best supports Depot training needs through frequent feedback with the training command (Page Field objective 1).

Long-Term Management

Wildlife Damage

If MCRD Parris Island identifies another wildlife conflict, a damage control program will be established. The program will have four parts (Dolbeer et al. 1994):

- Problem definition: to determine the species and number of animals causing the problem, the amount of loss or nature of the conflict, and other biological and social factors related to the problem. To accomplish this, the Depot will keep records for the following:
    - Ecology of the problem species: to understand the life history of the species, especially in relationship to the conflict;
    - Control method: takes the information gained from parts 1 and 2 and develops an appropriate management program to alleviate or reduce the conflict;
    - Evaluation of control: assesses the reduction in damage in relation to costs and impact of the control on target and non-target populations and the environment.

Wildlife Disease

There have been no reports of diseases affecting wildlife or humans on the Depot.

However, MCRD Parris Island will have a long-term management policy of public awareness (*e.g.,* informing employees and visitors) about the issues of concern to management.

Management will focus on, but will not be limited to, the following issues:

- Knowledge of the diseases in the area and the specific times of year that present the greatest risk of exposure.
- Knowledge of, and recognition of, early symptoms of diseases and the condition of exposure.
- The use of extreme caution when approaching or handling a wild animal, especially one that looks sick or acts abnormally.
- The use of protective measures against fungal diseases where there is an accumulation of animal feces (*e.g.,* under bird and bat roosts).
- Protection from vector-borne disease in high-risk areas using measures such as mosquito or tick repellent or wearing special clothing.
- Reduction in host populations and their ectoparasites. Eliminating undesirable man-made wildlife attractants such as exposed garbage and unmaintained picnic areas.

Projects and Strategies

Project 16: Prevent Wildlife Damage and Disease

Strategy

MCRD Parris Island will prevent human/wildlife health conflicts by proper garbage handling and by either preventing problems before they occur or handling problems as soon as they occur through the use of appropriate assistance.

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

- Forest Pest Suppression Memorandum of Agreement between the Department of Agriculture and DOD, 11 December 1990, is the planning, coordination, and execution of field operations to prevent and suppress damaging forest insects and disease outbreaks;
- MCO 5090.2 Vol. 11 (0304) and OPNAVINST 5090.1D (12-3.11.c, 12-5.27), discusses laws that govern natural resources management relating to the protection and management of wildlife (i.e., game species).

Additional Sources of Information

- SCDNR, Nuisance Alligators: https://www.dnr.sc.gov/wildlife/publications/nuisance/alligators.pdf
- USDA APHIS: https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/ USGS National Wildlife Health Center: https://www.usgs.gov/centers/nwhc;
- Internet Center for Wildlife Damage Management: https://icwdm.org/

Armed Forces Pest Management Board: https://www.acq.osd.mil/eie/afpmb/

4.3.5 Fisheries Management

Finfish Management

Saltwater fishing at MCRD Parris Island is authorized from banks and piers in accordance with state regulations by Depot Order 5090.3B (Appendix VII) which restricts the locations available for fishing to maintain safety and security. Persons fishing on the Depot are required to abide by all South Carolina and federal laws and regulations.

- Where fishing occurs regularly, the Depot will regularly police the area to remove trash;
- Where feasible and useful, trashcans will be provided at frequently used fishing spots;
- Because fish move throughout the estuary around and on MCRD Parris Island, no habitat management is planned at this time; however, water quality will be protected and monitored;
- There is no freshwater fishing due to the lack of freshwater ponds, lakes, or streams.

Shellfish Management

The shellfish cooperative agreement of 1978 (Appendix IX) controls shellfishing around the Depot. Access to the shellfish areas specified under the cooperative agreement by the general public is allowed by boat, but access to areas within the impact area of the rifle range are closed to boats during operation of the range. Depot personnel may access the shellfish from land. A current, valid South Carolina saltwater fishing license is required to recreationally harvest shellfish. The SCDNR controls take of shellfish from the area covered by the shellfish cooperative agreement by limiting harvest days. Some commercial harvests may be allowed depending on SCDNR's evaluation of the resources the previous year. As required by the cooperative agreement, SCDNR reports the annual commercial harvest to the Commanding General yearly.

Objectives

- Provide fish- and wildlife-based outdoor recreation, including hunting, appropriate to the present resource base and compatible with military use of the Depot (Depot-wide objective 4);
- Maintain existing cooperative management for the areas covered by the shellfish cooperative

agreement (Depot-wide objective 19);

- Monitor water quality in Third Battalion Pond and the estuary (Third Battalion Pond objective 1);

Long-Term Management

Specific management considerations for fisheries habitat include the following: 1) providing access to the fishery, 2) monitoring harvest, and 3) water quality management. MCRD Parris Island will monitor these management principles with the assistance of the SCDNR in order to sustain the Depot's fisheries resources. Because Third Battalion Pond is unique, this system may be further studied.

Water Quality Management

Good water quality is essential to successful fish production. Water quality will be monitored in cooperation with the plans partners and the South Carolina DHEC.

Projects and Strategies

Project 17: Provide Fishing Access

Strategy

Maintain and improve existing recreational fishing opportunities at MCRD Parris Island by maintaining the existing fishing piers and boat ramps. Make the facilities Americans with Disabilities Act of 1990 (ADA) compliant where feasible.

Project 18: Water Quality and Other Fishery Monitoring.

Strategy

Monitor Third Battalion Pond's water quality on at least a yearly basis.

Laws, EOs, Regulations, Directives, and Memoranda Relevant to Fisheries Management

- EO 12962 directs Federal agencies to cooperate in conservation of aquatic resources and enhancement of opportunities for recreational fishing.

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

- Fish and Wildlife Coordination Act as amended; Public Law 85-624, 16 USC 661 et seq., this law was enacted to ensure that fish and wildlife conservation receives consideration equal to, and coordinated with, other features of water resources programs. Section 10 of the Act directs

Federal agencies to consult the USFWS, NMFS, and the appropriate state agencies before authorizing alteration to water bodies.

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

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

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

- MCO 5090.2 Vol. 11 (030304, 0304) and OPNAVINST 5090.1D (12-3.5), discusses natural resources management relating to wetland management.

- South Carolina Code of Laws, Title 50, Chapter 9, requires all people engaged in fishing activities to have a state issued license.

- South Carolina Code of Laws, Title 50, Chapter 13 Protection of Fish, describes the regulations governing fishing activities in state waters.

- South Carolina Marine Resources Act of 2000, governs commercial and recreational salt-water fishing.

Additional Sources of Information

- SCDNR Wildlife and Freshwater Fisheries Division, Wildlife Biologist: (803) 259-5474;

- SCDNR Fishing Information: https://www.dnr.sc.gov/fishing.html

- South Carolina Sea Grant Consortium: https://www.scseagrant.org/ Outdoor

4.4 OUTDOOR RECREATION

For the purposes of this INRMP, outdoor recreation is defined as the use of natural resources where the primary focus is on the understanding and use of the natural environment.

Outdoor recreation includes nature trails, picnic and camping areas, establishment and management of recreational trails, scenic rivers, and other consumptive and non-consumptive uses of natural resources. The use of off-road vehicles, as well as other highly developed outdoor uses such as golf courses, tennis courts, ball/athletic fields, or swimming pools is not considered outdoor recreation

in the context of this plan. In accordance with EO 11644, as amended by Executive Order 11989 and Depot Order 5090.2B – Use of off-road recreation vehicles on Marine Corps lands; off- road vehicles are specifically prohibited on the Depot.

Military and DOD vehicles being used in training or military operations are not considered off-road vehicles, however, Depot Order #### regulates/prohibits vehicles from driving in wetlands.

4.4.1 Objectives

- Maintain records and collect data of fish- and wildlife-based outdoor recreation to determine desired and needed activities (Depot-wide objective 3).
- Provide fish- and wildlife-based outdoor recreation, including hunting, appropriate to the present resource base and compatible with military use of the Depot (Depot-wide objective 4).
- Upgrade, refurbish, or replace at least one recreation facility every other year. Each improved facility will be made accessible to the handicapped (Depot-wide objective 5).
- Maintain populations of all animals appropriate for the local area, habitats, and size of the Depot; maintain average or better populations for species determined to be declining in the region (Depot-wide objective 8).
- Monitor the deer herd through collection of information from harvested deer supplemented with other studies as recommended by the state (Depot-wide objective 9).
- Maintain a low enough deer population, through hunting, to support increased biodiversity of other species, reduce or eliminate deer/auto collisions, and reduce tick populations (Depot-wide objective 14).

Hunting

Hunting is authorized on the Depot to control deer and provide recreation for Depot personnel and their dependents. The hunting program is controlled under the Controlled Deer Hunt SOP (Appendix V).

Fishing

No freshwater fisheries are present for management. Management of the shellfish resources is in accordance with the 1978 Cooperative Agreement with SCDNR. Fishing on the Depot is controlled under SOP blahblah Fishing

Nature Trails and Study

The forests on the Depot are available for nature observation and study by Depot personnel. Current nature trails are along the northwest side of Third Battalion Pond and near Santa Elena just south and east of the golf course (Figure 15) and two new sections of trails adjacent to the newly developing Earth Day Park across from the MCX. Many vistas are available from parking areas,

from the golf course, and from roadways around the Depot. These areas will be exhibited by the addition of appropriate signage, parking areas, maps, and displays; some of the areas will be developed into a bicycle/auto birding trail with a map showing where different bird species are likely to be found.

Horseback Riding

Horseback riding is not authorized on the Depot.

Boating

Two boat ramps are maintained for the use of Depot personnel and their dependents (Figures 2 & 14).These boat ramps will be maintained and enhanced as funding permits.

Camping and Picnic Areas

Camping is not currently authorized on the Depot; however, a recreational vehicle area is available for use through MCCS and is located in the old Argonne trailer park area. Picnic areas are present on Horse Island, on Scout Island across the road from Third Battalion Pond, next to Ballast Creek along Cuba Street, and at Elliott's Beach (Figure 16). Picnic tables and picnic areas are also available at the new MCX, the old MCX site and at the end of Wake Boulevard near the ranges.

4.4.2 Projects and Strategies

Project 19: Conduct Recreational Hunting and Fishing Program

Strategy

Implement projects 15 (Manage Deer), and 17 (Provide Fishing Access) in a manner that maximizes outdoor recreation opportunities for Depot personnel and their dependents.

Project 20: Provide Non-Consumptive Nature Observation Opportunities.

Strategy

Maintain forest roads and nature trails to allow passive outdoor recreation such as walking, jogging, birdwatching, etc. Provide observation points along roads where visitors and residents can observe nature.

Project 21: Natural Resources Public Outreach

Strategy

Provide Depot personnel, dependents, and the public with information about the recreational and other natural resources available at MCRD Parris Island to enhance cooperation and understanding between the community, Depot personnel, and MCRD Parris Island regarding the management of the Depot's natural resources.

4.4.3 Laws, Executive Orders, Regulations, Directives, and Memoranda Relevant to Outdoor Recreation

- Sikes Act and Improvement Act of 1997, 16 USC 670a(b)(1)(G), requires public access to a military Depot for the necessary, appropriate, and sustainable use of natural resources by the public to the extent that the use is not inconsistent with the needs of the fish and wildlife resources or with safety and military security;

- Outdoor Recreation – Federal/State Program Act, 16 USC 460 P-3, defines a program for managing lands for outdoor recreation;

- MCO 5090.2 Vol. 11 (030409, 030410) and OPNAVINST 5090.112-3.11), discusses natural resources management relating to the protection and management of outdoor recreational resources.

4.4.4 Additional Sources of Information

- National Park Service: https://www.nps.gov/index.htm

- NPS Southeast Regional Office: (404) 507-5792;

- South Carolina State Park Service: (803) 734-0156; https://southcarolinaparks.com/

4.5 LAW ENFORCEMENT

The Depot will enforce state and federal natural resources related laws aboard MCRD Parris Island in coordination and cooperation with the USFWS and SCDNR. The Depot will maintain a full time CLEO to enforce these laws and regulations. The Depot will coordinate with State and federal law enforcement officials to allow those agencies to execute duties on the installation when required subject to appropriate safety and security precautions. Enforcement of state and federal laws and Depot orders will protect game and non-game species from poachers, protect habitats and facilities from vandalism and inadvertent destruction, and ensure an equitable distribution of harvested game and fish.

4.6 STAFFING AND TRAINING

This section addresses the staffing, training and technology of the natural resources program at MCRD Parris Island necessary to manage the natural resources at MCRD Parris Island and to implement this INRMP as required by the SAIA.

The natural resources staff currently consists of one (1) full-time NRM, one full time CLEO, and one full-time natural resources specialist under the direction of the ENVDIV Director. Considering the size of the Depot, this is adequate.

The NRM for the Depot will continue to ensure that natural resources management practices are consistent with military mission requirements. The NRM will also review MCRD Parris Island military activities that potentially impact natural resources (e.g., wetlands, natural areas, floodplains, habitats, water quality, etc.). This will allow actions affecting natural resources to be identified early, and potential problems with sensitive resources (*e.g.* threatened and endangered species,

wetlands, floodplains) to be addressed in the most efficient manner compatible with the completion of the mission and protection of those resources.

Training is essential in providing and sustaining skills necessary in managing the natural resources program at MCRD Parris Island. The interdisciplinary nature of the natural resources positions requires attending pertinent conferences, workshops, symposia, and training courses.

4.6.1 Projects and Strategies

Project 22: Natural Resources Staffing.

Strategy

Maintain adequate staffing levels to implement the INRMP. This will include:

- ENVDIV Director (Oversees all environmental programs on the Depot);
- NRM (Natural Resources Professional with direct responsibility for the Natural Resources Program);
- CLEO (Federal Law Enforcement Training Center trained biologist responsible for natural resources law enforcement duties on MCRD Parris Island and assisting with other natural resources management on an as needed/as available basis);
- Natural Resources Specialist;
- Specific tasks, such as spraying herbicides to kill invasive plants, surveys and other research can be performed by contract personnel under the direction of the actual federal employees listed above.

Project 23: Natural Resources Training

Strategy

Provide natural resources personnel with proper training/certifications for programs identified in this INRMP and provide information regarding natural resources laws and nature in general to Depot personnel and their dependents.

4.7 MONITORING

Monitoring is essential to understanding the progress, or lack thereof, made during the implementation of this INRMP. Monitoring is also required by 32 CFR Part 190, DOD Instruction 4715.03, EO 13202, and the Marine Corps' "Handbook for Preparing, Revising, and Implementing INRMPs".

The monitoring described below is a compilation of other monitoring from the rest of the plan. This provides an overall picture of the information managers will have available to institute adaptive

management, make adjustments to the plan at the annual reviews, and provide a record of accomplishments.

4.7.1 Objectives

- Determine species richness and diversity Depot-wide and by area of the Depot so biodiversity can be monitored and maintained (Depot-wide objective 6);
- Determine indicator species or criteria for future monitoring of management actions (Depot-wide objective 7);
- Monitor the deer herd through collection of information from harvested deer supplemented with other studies as recommended by the state (Depot-wide objective 9);
- Monitor, maintain, and provide a conservation benefit for endangered species on the Depot (Depot-wide objective 10).

General Monitoring

- Keep records of all management actions including food plots, prescribed fire, timber sales, surveys, etc.

Soil and Shoreline Erosion Monitoring

- Natural resources personnel will check suspected areas for soil and shoreline erosion during their regular rounds of the Depot. Areas of suspected erosion will be photographed at least twice yearly to determine if erosion is occurring and how fast it is occurring.

Wetlands Monitoring

- Keep records of area of wetlands created, restored, enhanced, drained, or filled each year.

Invasive Species Monitoring

- Monitor the efficacy of treatment with field notes, photographs, and test plots. Monitor both the reduction in invasive plants and the return of desired native plants.

Forest Monitoring

- Monitor forest periodically for disease or pest outbreaks;
- Inventory the forest stands no later than 2025 to make informed choices for the next plan;
- Keep records of area burned each year by prescribed fire and wildfire;
- Keep records of all timber sales including salvage operations.

Wildlife Monitoring

- Keep records of deer harvested. For each deer collect information on sex, age, weight, # points, condition, and location taken. Provide this information to the SCDNR deer biologist to help determine appropriate harvest. Additional detail can be found in the Controlled Deer Hunt SOP.
- Conduct night spotlight surveys around Depot at least yearly. Keep records of age (adult or fawn), sex (when possible) and number of points.
- Keep records of all deer/auto collisions.
- Conduct point counts for painted buntings and brown-headed nuthatches (and other Neotropical migrants) during late May to early June each year. Use the existing points. Conduct searches for loggerhead shrikes in late March or April of each year.
- Conduct winter bird monitoring at the existing plots on a yearly basis.
- Conduct shorebird and wading bird surveys in conjunction with SCDNR.
- Search for bald eagle nests each December and January.
- Look for wood storks each summer while conducting other surveys.
- Survey bat populations; look for southeastern myotis and Rafinesque's big-eared bat in tree roost and northern yellow bats under palmetto leaves on an opportunistic basis, and other listed or sensitive species.
- Maintain records of all migratory birds taken as a result of military readiness activities.
- Set up furbearer census stations in cooperation with SCDNR.
- Set up a northern bobwhite call count route in cooperation with SCDNR.
- Monitor southern fox squirrel population.
- Conduct periodic small mammal surveys.
- Conduct periodic herpetofaunal surveys.
- Monitor eastern diamondback rattlesnake population.
- Conduct vegetation surveys and monitor impacts of sea level rise on vegetation.

4.8 INRMP REVIEW AND UPDATE

4.8.1 Project 24: INRMP Review

Strategy

MCRD Parris Island will review the plan annually with the signature agencies.

4.8.2 Project 25: Renew INRMP

Strategy

MCRD Parris Island will renew the plan every 5 years. Complete rewrites may not be necessary if annual reviews have been conducted and the plan updated each year.

5.0 NATURAL RESOURCES PROJECTS

Natural resource project recommendations for MCRD Parris Island are provided in Table 6 below. Each project description includes guidelines to ensure that natural resources management at the Depot maintains regulatory compliance, incorporates principles of ecosystem management, and enhances and protects the natural resources at the Depot. Each recommendation is ranked in priority from 1 to 3, with 1 being the highest priority for implementation as resources and funding are available. Additionally, the prime legal drivers, a cost estimate, and potential funding sources are identified. Natural resources program administration and day-to-day program activities are not included in the table.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
Land Management Recommendations								
1	Maintain current wetland delineations for the Depot verified with the USACE in areas of likely development. When construction activities cannot be avoided within wetlands or Waters of the U.S., a jurisdictional determination and verification with the USACE should be completed before proceeding. Continuously update GIS layers in wetland maps.	*CWA, EO 11990: Protection of Wetlands*	1	Project Dependent (variable cost)	OPBUD CMP22	Contract	Recurring	Measure of success: use of accurate wetland map so that no CWA violations occur from dredge or fill operations.
2	Enhance existing wetlands by: • Prescribed fire—continue to prescribe burn for pine stands in wetlands on a 3-year rotation; • Trash removal—use volunteers on Earth Day or River Sweep; • Invasive exotic plants elimination—contract pesticide and herbicide applications following standards and certifications.	*CWA, EO 11990: Protection of Wetlands, EO 13112: Invasive Species*	1	Project Dependent (variable cost)	OPBUD CMP22	Contract pesticide application; in-house for clean-up and burning	Recurring	Measure of success determined through monitoring.
3	Monitor wetland function periodically: • Keep records of area of wetlands created, restored, enhanced, drained or filled each year. This includes the area of pinewood ponds burned each year. • Evaluate tidal wetlands for water quality using the South Carolina Department of Health and Environmental Control (DHEC) sampling procedures.	*CWA, EO 11990: Protection of Wetlands*	1	Project Dependent (variable cost)	OPBUD CMP22	Contract for surveys; in-house for record keeping	Recurring	Measure of success: completion of monitoring.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
4	Grounds maintenance and landscaping: • Contract study of maintained areas to determine which ornamental plantings are invasive exotics and develop a plan to eliminate or contain the problem plants. Evaluate the potential to replace the tamarix (*Tamarix* sp.) along roads with sea oxeye, saltmeadow cordgrass, hairawn muhly, gulfhairawn muhly, and other low growing native species appropriate for the soil and salt conditions at these locations. • Educate Depot and contractor personnel on the principles of grounds maintenance and landscaping discussed in this INRMP.	*EO 13112: Invasive Species; OPNAVINST 5090.1D (12-3.8.e)*	2	Project Dependent (variable cost)	OPBUD CMP22	Contract	Completed Invasive Species Study in 2010; Tasks ongoing	Completed the Parris Island Depot Invasive Plant Species Control Monitoring Report in 2010. Other tasks are ongoing.
5	Invasive and exotic species control: implement the Parris Island Depot invasive plant management Report: • Monitor the efficacy of treatment with field notes, photographs, and test plots. • Re-treat where necessary to improve and maintain control. Use monitoring to change techniques and methods as needed. • Prohibit the planting of invasive species outlined in report and replace with native plants. • Control fire ants through approved methods and partner with state and federal agencies to use biological control when feasible. • Support pollinator conservation by applying the concepts of Integrated Pest Management (IPM) to help eliminate and reduce unnecessary pesticide use management personnel aware of which areas of the Depot are important for pollinator conservation. See USFWS (2018) for further guidelines to promote pollinators.	*EO 13112: Invasive Species; MCO 5090.2 Vol. 11 (030202), OPNAVINST 5090.1D (12-3.8.g, 12-3.10, 12-5.33)*	1	Project Dependent (variable cost)	OPBUD	Contract	Completed Invasive Species Study in 2010; Tasks Ongoing	Completed the Parris Island Depot Invasive Plant Species Control Monitoring Report in 2010. Will continue to monitor, treat, and replace invasive species.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
Forest Management Recommendations								
6	Forest product sales: Harvest timber as described to maintain an even distribution of forest age classes, open canopy, suitable conditions for continued growth, and to provide forest products to the local economy. May include regeneration of new stands.	*SAIA*	2	Project Dependent (variable cost)	FRA	Contract with help from NAVFAC SE	Recurring	Measure of success: port-harvest evaluations.
7	Fire management: • Conduct burns in accordance with the 2013 Prescribed Burning for Forestry Operations and Timber Management SOP (Appendix X); • Burn pine stands, including wetland inclusions, in a manner that mimics historical fire regimes to achieve a reduced understory and fuel loads; • Burn as much as feasible each year (approximately 300 acres) so that over 10 or more years, an average of 1/3 to 1/2 of the stands are burned each year; • Maintain needed equipment, training, and certifications; • Maintain fire breaks and forest roads.	*SAIA, MCO 5090.2 Vol. 11 (030206), (OPNAVINST 5090.1D 12-3.8.j)*	2	Project Dependent (variable cost)	FRA OPBUD	Installation personnel; contract	Completed and Recurring	Completed a Prescribed Burning for Forestry Operations and Timber Management SOP in 2013 (2022).

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
8	Forest protection: In addition to the fire management in Project 7 above: • Continue to follow the MCRD Parris Island Tree Protection and Preservation SOP. • Implement a tree hazard assessment (THA) both before and after a storm event to identify, analyze, and evaluate tree risks on the Depot. • Monitor forest periodically for disease or pest outbreaks and protect remaining healthy trees when desirable from both a forest and wildlife management perspective. The normal treatment is harvest of affected trees along with a buffer area. • Inventory the forest stands to make informed choices for the next plan. Implement a tree hazard assessment (THA) both before and after a storm event to identify, analyze, and evaluate tree risks on the Depot.	*SAIA, MCO 5090.2 Vol. 11 (030206), (OPNAVINST 5090.1D 12-3.8.j)*	2	Project Dependent (variable cost)	FRA	Contract, NAVFAC	Completed and Recurring	Completed a THA SOP in 2019 that recommends BMPs to mitigate tree risks to personnel safety and minimize tree removal. Completed a Tree Protection and Preservation SOP in 2013 (2022) to protect unique trees from damage, removal.
9	Forest inventory: Update the forest management inventory system with measurements of the forest such as species, acreage, size class, basal area, volume, etc.	*SAIA, MCO 5090.2 Vol. 11 (030206), (OPNAVINST 5090.1D 12-3.8.j)*	2	Project Dependent (variable cost)	FRA	Installation personnel; contract; NAVFAC SE	Completed and ongoing	Completed a Champion Tree Survey in 2010 to identify trees for preservation.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
10	Timber stand improvement: Includes prescribed fire described in Project 7 above and a variety of techniques such as mechanical thinning and selective herbicide use that are occasionally used to increase the production of timber stands. Actual project costs for larger actions will be added to the plan following the forest inventory.	*SAIA, MCO 5090.2 Vol. 11, OPNAVINS T 5090.1D (12-3.8.j)*	2	Project Dependent (variable cost)	FRA OPBUD	Installation personnel; contract	Recurring	Measure of success determines through monitoring projects.
Fish and Wildlife Management Recommendations								
11	Non-game wildlife management: • Purchase or construct and maintain nest boxes; • Construct brush piles from timber slash; • Plant food plots; • Maintain forest stands conducive to priority species from State Wildlife Action Plan; • Monitor for effectiveness; • Direct development outside of ecologically important areas where practicable; • Control and eradicate invasive species.	*Fish and Wildlife Conservation Act, SAIA, ESA, MCO 5090.2 Vol. 11 (0304), OPNAVINS T 5090.1D (12-5.24)*	3	Project Dependent (variable cost)	OPBUD FRA	Installation personnel; contract	Completed and recurring	Completed a Wildlife Protection SOP in 2013 (2022) that provides guidelines for personnel, staff and visitors to ensure safety and protection of wildlife and critical habitats.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
12	Migratory bird surveys: Continue to monitor migratory birds annually by completing surveys during breeding season with emphasis on painted buntings and winter surveys for grassland sparrows. • Conduct point counts primarily for painted buntings, brown-headed nuthatches, and eastern wood peewees and provide data to other groups as applicable. • Conduct searches for winter grassland sparrows the year following burns in open pine stands with a grass/forb ground cover. • Conduct counts of shorebirds around the Depot periodically during spring, fall, and winter. • Monitor nesting bald eagles. • Identify and count (to the extent practicable) any migratory birds that are unavoidably taken during military readiness activities. Report these takings up the chain of command. (Note that taking is defined as kill, harm, or harass.) • Investigate creating wading bird feeding areas at currently tidal former borrow pits by using large gravel and stones to slow drainage of these areas and trap smaller fish for the wading birds to feed on. • Continue collaborative partnerships to study and manage migratory birds and other non-game species.	*SAIA, ESA, MBTA, Bald and Golden Eagle Protection Act*	1	Project Dependent (variable cost)	OPBUD CMP22	Installation personnel to reduce costs; contract if needed	Completed and Recurring	Completed Wildlife Monitoring SOP in 2013 (2022). These activities should be incorporated into a yearly maintenance schedule.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
13	Rare, threatened, and endangered species surveys • Look for new wood stork loafing feeding, and nesting areas during the warmer parts of the year. • Check out suspected bat roost trees for the presence of the state-listed bat species. Follows USFWS guidance for northern long-eared bats in Appendix XI. • Conduct other surveys as needed after consulting with cooperating federal and state biologist. • Review results of surveys yearly with cooperating agencies and improve management as necessary to maintain the species.	*SAIA, ESA, MBTA, MMPA, MCO 5090.2 Vol. 11 (0304), OPNAVINST 5090.1D (12-3.7, 35-3.21)*	1	Project Dependent (variable cost)	OPBUD CMP22	Installation personnel in cooperation with USFWS and SCDNR		Completed Wildlife Monitoring SOP in 2013 (2022). These activities should be incorporated into a yearly maintenance schedule.
14	Manage small game habitat As time, funding, and volunteer help permit: • Plant food plots; • Prescribe burn pine stands on a 2-to-3-year rotation, but burn some pine stands more frequently to promote northern bobwhite; • Construct brush piles from timber slash with volunteer labor; • Maintain forest stands in conditions conducive to northern bobwhite; • Review results of surveys and management yearly with cooperating agencies to maintain target species; • Set up one or more furbearer census stations in conjunction with SCDNR; • Set up a quail call count census in conjunction with SCDNR.	*SAIA,* *MCO 5090.2 Vol. 11 (0304), OPNAVINST 5090.1D (12-3.11.c, 12-5.27)*	2	Project Dependent (variable cost)	FRA OPBUD CMP22	Installation personnel; contract	Burn pine stands every 2-3 years	Burn permit required from State Forestry Department; consultation with USFWS.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
15	Manage Deer Conduct habitat improvements, allow hunting to the extent that the species can sustain the take, and monitor the deer herd. • Conduct deer hunts in accordance with SCDNR regulations in a manner compatible with Depot security and safety considerations; • Plant food plots; • Maintain forest stands in conditions conducive to deer production through stand thinnings and prescribed fire; • Keep records of all deer taken; • Review results of surveys and management yearly with cooperating agencies and improve management as necessary to maintain the species; • Utilize 4-poster deer feeders as needed to apply pesticides to deer in order to keep tick numbers down.	*SAIA,MCO 5090.2 Vol. 11 (0304), OPNAVINST 5090.1D (12-3.11.c, 12-5.27)*	1	Project Dependent (variable cost)	OPBUD	Installation personnel	Completed and Recurring	Completed Controlled Deer Hunt SOP in 2013 to ensure the Depot maintains compliance with all hunting and wildlife laws and regulations. These activities should be incorporated into a yearly maintenance schedule.
16	Prevent wildlife damage and disease • Control all putrescible garbage to ensure that raccoons, rats, opossums, armadillos, etc. are not attracted to Depot facilities, and their populations are not artificially elevated by artificial (human) foods; • Control feral cats per Armed Forces Pest Management Board Technical Guide (https://www.acq.osd.mil/eie/afpmb/); • Treat deer for ticks when needed (project 15); • When venomous snakes are encountered in intensive training areas, move snakes to more remote locations; determine fate of snakes to ensure they do not return to their capture location or other unsuitable areas. (completed)	*SAIA,MCO 5090.2 Vol. 11 (0304), OPNAVINST 5090.1D (12-3.11.c, 12-5.27)*	2	Project Dependent (variable cost)	OPBUD CMP22	Installation personnel; contract	Ongoing and recurring	Ongoing rattlesnake study/monitoring

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
17	Maintain and improve recreational fishing opportunities • Repair piers and boat ramps as needed; • Make the facilities ADA-compliant where feasible; • Monitor use of piers and boat ramps; • Add new piers and boat ramps if the need exists.	*SAIA, EO 12962—Recreational Fisheries, MCO 5090.2 Vol. 11 (030304), OPNAVINS*	3	Project Dependent (variable cost)	PWD ASSET MANAGEMENT	Installation personnel; contract		Construction of piers and boat ramps requires permits from USACE and SCDHEC
18	Monitor water quality and fish samples in Third Battalion Pond • The CLEO will conduct creel checks of anglers fishing on the Depot; • Data will be summarized yearly and provided to the NRM for INRMP annual reviews.	*SAIA, CWA, MCO 5090.2 Vol. 11 (030304), OPNAVINST 5090.1D (12-3.5)*	?	Project Dependent (variable cost)	OPBUD	Installation personnel; contract; SCDNR	Recurring annually	
Outdoor Recreation Management Recommendations								
19	Conduct Recreational Hunting and Fishing Program • Manage deer (see Project 15) and provide fishing access (see Project 17) to maximize outdoor recreation opportunities for Installation personnel and their dependents.	*EO 12962—Recreational Fisheries*	3	Project Dependent (variable cost)	OPBUD	Installation personnel; contract		Measure success with hunter and fisherman days; harvest data

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
20	Provide non-consumptive nature observation opportunities • Maintain forest roads and trails. Upgrade and add signage to improve interpretive opportunities. • Add information kiosk at suitable sites around the Depot. • Add picnic tables in suitable areas around the Depot, for example in administrative areas for lunch breaks. • Maintain boat ramps and fishing/observation piers/platforms. • Make all new facilities ADA-compliant. • Upgrade existing facilities to be ADA-compliant every other year. • Combine existing vistas and nature observation areas into an auto/bicycle nature observation trail with printed brochures, maps, and signage.	*SAIA, MCO 5090.2 Vol. 11 (030409, 030410), OPNAVINST 5090.112-3.11)*	3	Project Dependent (variable cost)	OPBUD	Installation personnel; contract	Continuous with yearly funding	Measure success through surveys of recreational users.
21	Natural resources public outreach • Provide Depot personnel, dependents, and the public with information about the natural resources and outdoor recreation opportunities at MCRD Parris Island with Depot newspaper, handouts, brochures, etc.; • Work with off-base groups to provide recreational opportunities for the general public when they can be conducted safely and without interfering with training; • Conduct other public outreach such as Earth Day, National Migratory Bird Day, and Christmas Bird Counts.	*SAIA, MCO 5090.2 Vol. 11 (030409, 030410), OPNAVINST 5090.112-3.11)*	3	Project Dependent (variable cost)	OPBUD	Installation personnel; contract	Continuous with yearly funding	Measure of success is completion of outreach activities.

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
Staffing and Training Management Recommendations								
22	Natural resources staffing Maintain adequate staffing levels to implement the INRMP including: • ENVDIV Director: Oversees environmental programs on Depot; • NRM: Direct responsibility for the Natural Resources Program; • CLEO (Federal Law Enforcement)-trained biologist responsible for natural resources law enforcement and other natural resources management as needed; • Natural Resources Specialist;	*SAIA*	1	Project Dependent (variable cost)	Depot	Installation personnel		Measure of success is successful implementation of INRMP
23	Natural resources training • Provide training to the Depot's NRM, CLEO, and other staff yearly. Training will be directed at military requirements, legal requirements, and natural resources science. • Train other Depot personnel regarding the protection, uses, and benefits of natural resources. Examples of training include: newspaper articles, informational brochures, displays and kiosks, nature trail signage, hunter safety course, events such as Earth Day and Welcome Aboard Orientations.	*SAIA*	1	Project Dependent (variable cost)	OPBUD	Contract NAVFAC	Train staff yearly; public outreach training is continuous	Measure of success is amount of training provided; continued success of natural resources program

Table 6. Project Implementation Schedule including Planning Cost Estimates for Specific Tasks								
Project #	**Project Description**	**Prime Legal Driver/ Initiative**	**Priority**	**Cost Estimate**	**Funding Source[1]**	**Funding Vehicle**	**Anticipated Time Frame**	**Comments**
INRMP Reviews and Updates								
24	INRMP review • Review the plan annually with the signature agencies for effectiveness and implementation. NAVFAC SE will help with this if requested to do so. • Following the annual review, update the INRMP by making changes to the INRMP as determined at the annual review.	*SAIA*	1	Project Dependent (variable cost)	OPBUD CMP22	Installation personnel; cooperating agencies; contract	Recurring annually	Measure of success: completed annual reviews
25	Renew INRMP Renew INRMP every 5 years. Complete rewrites may not be necessary if annual reviews have been conducted and the plan updated each year. • During the fourth annual review with the signature agencies, determine if a rewrite is necessary or if minor updates will suffice. • Update the project table to be sure projects are scheduled for at least the next 5 years. • If a complete rewrite is not necessary, make only the changes determined in the annual review and circulate the plan to appropriate parties for signature. • If a complete rewrite is necessary, initiate rewrite in full cooperation with signature agencies.	*SAIA*	1	Project Dependent (variable cost)	CMP22	Installation personnel; cooperating agencies; contract	Recurring annually	Measure of success: completed annual reviews

[1] Fund Source: OPBUD=Operations Budget; FRA=Forestry Reserve Account; CMP22=Centrally Managed Program funds from HQMC.

6.0 REFERENCES

Cronk and Fuller. 1995. Plant Invaders: The Threat to Natural Ecosystems, Chapman & Hall, New York.

Dolbeer, R., N. Holler, and D. Hawthorne. 1994. *Identification of Wildlife Damage: An Overview*, Prevention and Control of Wildlife Damage. Cooperative Extension Division, Institute of Agriculture and Natural Resources; University of Nebraska – Lincoln; US Department of Agriculture, Animal Plan and Health Inspection Service, Animal Damage Control; Great Plains Agricultural Council, Wildlife Committee.

Environmental Protection Agency (EPA). 2009. Global Climate Change Impacts in the United States. Available online at: http://www.globalchange.gov/publications/reports/scientificassessments/us-impacts. Accessed March 2021.

EPA. 2011. National Pollutant Discharge Elimination System (NPDES). Available online at: https://www.epa.gov/compliance/clean-water-act-cwa-action-plan-implementation-priorities-changes-improve-water-quality. Accessed December 2020.

EPA. 2016. EnviroAtlas. Data. Available online at https://enviroatlas.epa.gov/enviroatlas/interactivemap. Accessed January 2021.

EPA. 2017. Preliminary Healthy Watersheds Assessment. Office of Water, Healthy Watersheds Program. Available online at: https://www.epa.gov/hwp/download-preliminary-healthy-watersheds-assessments. Accessed January 2021.

EPA. 2020. EPA Green Book Nonattainment Areas, South Carolina. Available online at: https://www3.epa.gov/airquality/greenbook/anayo_sc.html. Accessed December 2020.

EPA. 2020a. Sole Source Aquifers for Drinking Water. Available online at: https://www.epa.gov/dwssa. Accessed January 2021.

Federal Emergency Management Agency (FEMA). 2020. FEMA Flood Map Service Center. Available online at: https://msc.fema.gov/portal/home. Accessed January 2021.

Hilton Head Audubon Society. 2021. DOD PFI Bird Checklist. Available online at: https://www.denix.osd.mil/dodpif/installations-bird-checklists-articles-and-information/bird-checklists/mcrd/index.html. Accessed March 2021.

McLean, R.G. 1994. Wildlife Diseases and Humans: Prevention and Control of Wildlife Damage. Cooperative Extension Division, Institute of Agriculture and Natural Resources; University of Nebraska- Lincoln; United States Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control; Great Plains Agriculture Council, Wildlife Committee.

National Oceanic and Atmospheric Administration (NOAA). 2020. Essential Fish Habitat. Available online at: https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat. Accessed December 2020.

NOAA National Centers for Environmental Information (NCEI). 2019 revision. State Climate summaries 149-NC. Available online at: https://statesummaries.ncics.org/downloads/NC-print.pdf. Accessed March 2021.

Nelson, J. B. 1986. The Natural Communities of South Carolina: Initial Classification and Description. South Carolina Wildlife & Marine Resources Department.

Partners in Flight (PIF). 2016. Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in Flight Science Committee. 119 pp.

Payne, D. F., M. A. Rumman, and J. S. Clarke. 2005. Simulation of Ground-Water Flow in Coastal Georgia and adjacent parts of South Carolina and Florida—Predevelopment, 1980, and 2000. US Geological Survey Scientific Investigations Report 2005-5089. http://pubs.usgs.gov/sir/2005/5089/pdf/sir2005-5089.pdf

Smoot, J.L., and R.D. Smith. 1999. Updated November 30, 1999. Soil Erosion Prevention and Sediment Control, University of Tennessee, Knoxville, Water Resources, Civil and Environmental Engineering.

South Carolina Department of Natural Resources (DNR). 2015. South Carolina's State Wildlife Action Plan (SWAP). Columbia, SC. Available online at: https://www.dnr.sc.gov/swap/index.html. Accessed January 2021.South Carolina Department of Natural Resources (DNR). 2021. Rare, Threatened, and Endangered Species Inventory. Available online at: https://www.dnr.sc.gov/species/index.html. Accessed February 2021.

United States Census Bureau. 2020. Census data. Available online at: https://data.census.gov/cedsci/. Accessed December 2020.

United States Fish and Wildlife Service (USFWS). 2018. Guidelines on pollinators in INRMPs. Available online at: https://www.fws.gov/fisheries/sikes_act/documents/INRMP-Guidelines-with-Pollinator-Addendum-4-19-18.pdf. Accessed March 2021.

United States Geological Survey. 1956. United States Earthquakes.

U.S. Global Change Research Program (USGCRP). 2018. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II (Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart [eds.]). U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018. Available online at: https://nca2014.globalchange.gov/highlights/regions/southeast. Accessed March 2021.

Whitaker, J. D., J. W. McCord, P. P. Maier, A. L. Segars, M. L. Rekow, N. Shea, J. Ayers, and

R. Browder. 2004. An ecological characterization of Coastal Hammock Islands in South Carolina.

Xeriscape Colorado, Inc. 1999. The Seven Xeriscape Fundamentals. Available online at: http://www.xeriscape.org/whatis.html.