FINAL INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

2017 FIVE YEAR PLAN UPDATE
(PLAN YEARS 2017 – 2021)

of

Armed Forces Experimental Training Activity Camp Peary

York County and James City County, Virginia

Prepared for

Department of Defense Armed Forces Experimental Training Activity Camp Peary
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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
Armed Forces Experimental Training Activity Camp Peary Williamsburg, Virginia

Plan Years 2017-2021

FIVE YEAR PLAN UPDATE

I approve the implementation of all activities in this Integrated Natural Resources Management Plan (INRMP) for the Department of Defense, Armed Forces Experimental Training Activity Camp Peary as supporting the military mission, while sustaining natural resources for future generations. This INRMP has been prepared pursuant to the Sikes Act (16 United States Code (U.S.C.) § 670 *et seq.)* and the Improvement Amendments of 1997. This INRMP has set appropriate and adequate guidelines for conserving and protecting the wildlife and other natural resources of this installation.

Approving Officials:

2/13/2018

Installation Director — Date

2/12/18

Environmental Coordinator — Date

Date of Annual Review/Update:

Name and Title of Reviewer(s):

In cooperation with: United States Fish and Wildlife Service (USFWS)
Virginia Department of Game and Inland Fisheries (DGIF)

EXECUTIVE SUMMARY

PURPOSE

Each military installation in the United States (US) is required to prepare and implement an Integrated Natural Resources Management Plan (INRMP) to maintain a balanced and integrated program for the management of natural resources. The goals of an INRMP are to integrate natural resources management with the military mission, protect and enhance natural resources, maintain land resources for future growth of the military mission, provide for a pleasing natural environment in which to work and live, and promote a general environmental awareness among military and civilian personnel. The INRMP also addresses future installation requirements and identifies projects to be accomplished over the duration of the plan. This INRMP was developed for Armed Forces Experimental Training Activity (AFETA) Camp Peary to comply with:

- The Sikes Act (16 United States Code [U.S.C.] § 670 *et seq.*), as amended;
- Department of Defense Instruction (DODINST) 4715.03, *Natural Resource Conservation Program*;
- Chief of Naval Operations Instruction 5090.1C, *Environmental Readiness Program Manual*;
- Chief of Naval Operations *Integrated Natural Resources Management Plan Guidance for Naval Installations* (April 2006); and
- AFETA Camp Peary Environmental Management System Policy.

This INRMP incorporates natural resource management policies, available regulatory guidance documents, and current natural resource data to produce a practical guidance document to be used by natural resources management staff on the installation. This INRMP should assist the natural resources manager in making proper management decisions which support mission operations while respecting the integrity of the natural environment and providing a sustainable environment for mission activities.

In accordance with the *Integrated Natural Resources Management Plan Guidance for Naval Installations*:

- Section 2.0 of the INRMP, Existing Conditions, discusses the current conditions and uses of the installation, including installation and regional land use, as well as the general physical and biotic environment of the installation,
- Section 3.0, Natural Resources Management Issues, describes the applicable regulatory requirements and management activities pertaining to specific program elements, and
- Section 4.0 of the INRMP, Summary of Management Recommendations, details management recommendations for implementation of the INRMP and lists potential projects to be covered during the 2017-2021 INRMP.

MAJOR INRMP INITIATIVES

Major initiatives recommended during the plan years of the INRMP include:

- Implement the management recommendations described in the *Shoreline Management Plan for AFETA Camp Peary* (2016);
- Comply with the *Forest Management Plan for AFETA Camp Peary* (2017). Subsequent updates should include a new forest inventory and updated forest stand mapping;
- Achieve consistent GPS data collection for all surveyed areas, jurisdictional delineations, forest stands, and other relevant data sets; and
- Integrate GIS use between Engineering, Public Works and Natural Resource staff by organizing, cataloguing and reconciling GIS data into a geodatabase for ease of access and consistency.

FIVE YEAR UPDATE (PLAN YEARS 2017 – 2021)

The previous INRMP covers the five-year period 2013-2017, and is reviewed annually by the installation, and revised and re-approved no less than every five years in cooperation with the United States Fish and Wildlife Agency (USFWS) and the Virginia Department of Game and Inland Fisheries (DGIF). The Environmental Manager is responsible for maintaining the accuracy of this document. This 2017 – 2021 Five Year INRMP Update document will update the existing conditions on the installation, document any changes to the existing natural resources management issues, detail new management recommendations for implementation of the INRMP, and list potential new projects to be covered during the 2017 – 2021 period.

NATIONAL ENVIRONMENTAL POLICY ACT

This plan will be reviewed in compliance with all associated documentation required for compliance with the National Environmental Policy Act (NEPA), which requires Federal agencies to consider environmental consequences of major proposed actions. This NEPA documentation is in the form of an Environmental Assessment (EA), which analyzes the potential consequences of the proposed action to implement the AFETA INRMP.

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ACRONYMS AND ABBREVIATIONS

AFETA	Armed Forces Experimental Training Activity
ASMFC	Atlantic States Marine Fisheries Commission
BASH	Bird/Animal Aircraft Strike Hazard
BMP	Best Management Practice
CAA	Clean Air Act
CFR	Code of Federal Regulations
CBPA	Chesapeake Bay Preservation Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNIC	Commander Naval Installations Command
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
DERP	Department of Defense Environmental Restoration Program
DGIF	Virginia Department of Game and Inland Fisheries
DMAP	Deer Management Assistance Program
DOD	Department of Defense
DODINST	Department of Defense Instruction
DOF	Department of Forestry
DON	Department of the Navy
DSS	Department of Shellfish Sanitation
E.O.	Executive Order
EA	Environmental Awareness
EC	Environmental Compliance
EMS	Environmental Management System
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
ES	Environmental Stewardship
ESA	Endangered Species Act
et seq.	At sequence
^{o}F	Fahrenheit
FEMA	Federal Emergency Management Administration
GHG	Greenhouse Gas Emissions
GIS	Geographic Information Systems
HUC	Hydrologic Unit Code
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
IR	Installation Restoration
LID	Low Impact Development
MBTA	Migratory Bird Treaty Act
MR	Munitions Response
MRA	Munitions Response Area

MR-AOI	Munitions Response- Area of Interest
MS-19	Minimum Standard 19
MSL	Mean Sea Level
NAAQS	National Association of Air Quality Standards
NAVFAC	Naval Facilities Engineering Command
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OPNAVINST	Office of the Chief of Naval Operations Instruction
PCB	Polychlorinated Biphenyls
ppm	Parts per million
ppt	Parts per thousand
Quad	Quadrangle Map
RMA	Resource Management Area
RPA	Resource Protection Area
SAIA	Sikes Act Improvement Act
SDZ	Surface Danger Zone
spp.	Species
SWM	Stormwater Management
SWMMP	Stormwater Management Master Plan
TMDL	Total Maximum Daily Load
TOYR	Time of Year Restriction
US	United States
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
UFC	Unified Facilities Criteria
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
UXO	Unexploded Ordnance
VAC	Virginia Administrative Code
VCP	Virginia Coastal Zone Management Program
VDH	Virginia Department of Health
VMRC	Virginia Marine Resources Commission
VPDES	Virginia Pollution Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WOUS	Waters of the United States
WQAIR	Water Quality Assessment Integrated Report

1.0 INTRODUCTION

1.1 PURPOSE AND GOALS

Under the Sikes Act (16 United States Code [U.S.C.] § 670 *et seq.*), as amended, Department of Defense Instruction (DODINST) 4715.03, *Natural Resource Conservation Program*, and Chief of Naval Operations Instruction (OPNAVINST) 5090.1C, *Environmental Readiness Program Manual*, the Department of Navy (DON) is required to implement and maintain a balanced and integrated program for the management of natural resources. The goals of this Integrated Natural Resources Management Plan (INRMP) are to integrate natural resources management with the military mission, protect and enhance natural resources, maintain land resources for future growth of the military mission, provide for a pleasing natural environment in which to work, and promote a general environmental awareness among military and civilian personnel. The INRMP must also address future installation requirements and identify projects to be accomplished over the duration of the plan.

This 2017 Five Year INRMP (2017 – 2021 Plan) has been prepared following the Chief of Naval Operations *Integrated Natural Resources Management Plan Guidance for Naval Installations* (April 2006) in order to comply with the aforementioned legislation and instruction to be reviewed and updated annually by the installation to incorporate future changes in environmental regulations, scientific advances in evaluation, and implementation methods for resource management.

1.2 AUTHORITY

The Sikes Act assigns responsibility to the Department of Defense (DOD) for carrying out programs and implementing management strategies to conserve and protect biological resources on its lands in cooperation with the United States Fish and Wildlife Service (USFWS) and appropriate state fish and wildlife agencies. The Sikes Act Improvement Amendments (SAIA) of 1997 requires each military department to prepare and implement an INRMP, unless otherwise excluded by the Secretary of the Navy. No such exclusion has been issued and the procedures outlined in SAIA are applicable to Armed Forces Experimental Training Activity (AFETA) Camp Peary. AFETA is responsible for conservation, protection, and management of natural resources on all lands within its boundaries. SAIA requires INRMPs to include, to the extent appropriate and applicable:

- Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetlands protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;
- Integration of and consistency among the various activities conducted under the plan;
- Establishment of specific natural resources management goals and objectives, and timeframes for proposed actions;
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of the fish and wildlife resources;
- Public access to the military installation that is necessary and appropriate subject to requirements necessary to ensure safety and military security;
- Enforcement of applicable natural resources laws and regulations; and
- No net loss in the capability of military installation lands to support the military mission of the installation.

INRMPs are to be prepared in cooperation with the USFWS and appropriate state fish and wildlife agencies, reflecting mutual agreement concerning the conservation, protection, and management of fish and wildlife resources.

1.3 RELATIONSHIP TO THE MILITARY MISSION

All natural resources management at the installation supports the military mission. Training and operations rely on the current facility setting. As such, natural resources management on the installation is conducted in concert with the military mission in order to maintain the existing natural resources for current and future training and operations activities. One goal of this INRMP is to minimize the potential for future training restrictions by increasing integration between natural resources management planning, training, and operations.

1.4 PLAN DEVELOPMENT AND REVIEW

Throughout the development of the plan, stakeholders, an interdisciplinary team, and a base INRMP working group met to discuss the INRMP, review the direction of the plan, and finalize proposals. The 2017-2021 INRMP was also developed in cooperation with the USFWS and the DGIF, per SAIA and DON guidance. Regional points of contacts for these agencies are listed below.

United States Fish and Wildlife Agency
Virginia Field Office
6669 Short Lane
Gloucester, Virginia 23061
804-693-6694

Virginia Department of Game and Inland Fisheries
4010 West Broad Street
Richmond, Virginia 23230
804-367-1000

Under the SAIA, the INRMP is required to undergo an informal annual review. This review should evaluate:

- INRMP implementation;
- Partnerships/cooperation and effectiveness;
- Team adequacy;
- INRMP impact on the installation mission;
- Status of Federally listed species and Critical Habitat;
- Ecosystem integrity; and
- Fish and wildlife management and public use.

In addition, annual reviews are used to verify that:

- All must-fund projects and activities have been budgeted for and implementation is on schedule;
- All required trained natural resources positions are filled or in the process of being filled;
- Projects and activities for the upcoming year have been identified and included in the INRMP;
- All required coordination both internally and externally with USFWS and state fish and wildlife agencies has occurred; and
- All significant changes to the installation's mission requirements or its natural resources have been identified.

If annual reviews determine that the current INRMP is effective and not in need of revision, with agreement from USFWS and the appropriate state agency, written documentation of the annual reviews may be used to substitute the formal five-year review. Annual reviews are documented in Appendix A of this INRMP. As a Federal action, INRMPs must be in compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. § 4231 *et seq*.). As such, if changes are identified which are outside of the scope of the existing NEPA document for the INRMP, the changes will be implemented at the five-year update, at which time additional NEPA analysis will take place. INRMPs are required to be updated no less than every five years. As part of the five-year update, the fish and wildlife portion of the INRMP are to be reviewed by the USFWS and DGIF. At the request of USFWS, a full on-line project review for impacts to threatened and endangered species should accompany the final draft INRMP when submitted for review. The on-line project review process can be initiated through the USFWS Virginia Ecological Services website.

1.5 MANAGEMENT STRATEGY AND POLICY

In order to comply with DOD policy and regulatory requirements including Executive Order 13693, AFETA has implemented an Environmental Management System (EMS), which provides a framework for making program decisions and ensures daily installation operations account for environmental issues. The EMS includes a policy statement signed by the Base Director stating that the installation will make decisions in a manner that considers environmental impacts. As stated in the AFETA EMS Policy, it is the policy of the installation to conduct and manage all operations in an environmentally responsible manner. AFETA strives to continually improve actions, processes, systems, and procedures related to environmental protection and pollution prevention. In support of the policy, the installation has established the following objectives:

- Integrate sound environmental practices into all activities and business decisions;
- Fully comply with all Federal, state, and local environmental laws and regulations, including Executive Orders (E.O.);
- Consider environmental impacts when making planning, purchasing, and operating decisions;
- Work continuously to improve the effectiveness of our Environmental Management Program;
- Communicate environmental commitments and performance to all employees to ensure all personnel are environmentally responsible;
- Respond to all concerns about the environmental effects of base operations;
- Establish environmental objectives and targets for performance and conduct regular internal evaluations to determine progress;
- Recognize and reward accomplishments, and implement corrective actions to mitigate nonconformance; and
- Reduce energy consumption (i.e., water, fuel, electricity usage) and reuse/recycle whenever possible.

AFETA is committed to implement and operate the EMS in a manner that will further enhance environmental performance. The EMS is a fully functional living management system. As such, the EMS is updated continuously and the Cross Functional Team meets quarterly to audit the progress of the EMS. The EMS is presented to upper management annually. The last external audit of the EMS was in 2007. The audit concluded that the EMS was functioning properly.

Installation Environmental Policy. AFETA is committed to environmental protection, continual environmental improvement, and pollution prevention. AFETA's environmental policy is to protect current and future training

capabilities by respecting and maintaining the natural environment. This policy includes the following components:

- Leveraging environmental leadership and technical capabilities to achieve sustainability and continual improvement;
- Protecting the environment to ensure current and future military readiness through sustained realistic training opportunities;
- Complying with all environmental requirements;
- Supporting joint environmental protection programs;
- Reviewing all proposed activities for potential environmental impacts in accordance with NEPA;
- Minimizing the impact on the environment through environmental quality assessment, education, pollution prevention, and use of Geographic Information Systems (GIS) technology;
- Promoting the cleanup of contaminated sites;
- Maintaining and enhancing the biodiversity of the ecosystem through integrated natural resources management; and
- Conserving the air, land, and water resources as vital assets.

Environmental Restoration Program. The AFETA Environmental Restoration Program (ERP) has identified, assessed, and characterized the cleanup and control of contamination from past waste disposal operations, spills, and munitions activities. The nature and extent of past operations within the boundaries of AFETA presents historical environmental concerns involving potential material releases that may be harmful to human health and the environment. These materials, if released into the environment, could lead to damage of cultural and natural resources and may be harmful to human health and the environment. Additionally, the Munitions Response program addresses munitions and explosives of concern, including unexploded ordnance, discarded military munitions, and munitions constituents, either at concentrations presenting an explosive hazard or at concentrations not presenting an explosive hazard but potentially presenting an environmental impact) at "other-than-operational" military ranges and other sites (i.e., closed, transferred, and transferring military ranges and sites not located on or within an operational range).

Currently there are five active Installation Restoration (IR) sites (Site 41C, Site 49D, Site 51, Site 61, and Site 62) and four active Munitions Response (MR) sites (MRA-2, MRA-3, MRA-3A, and MRA-4) on AFETA. Site descriptions, investigations, and actions of active IR sites are discussed in the *Final Site Management Plan Fiscal Year 2018* (September 2017).

Installation Natural Resources Management Vision. Management of installation natural resources will support sustainable military use through the application of an integrated approach to ecosystem management. The Environmental Manager operates the Environmental Program and the Chief of Public Works operates the Natural Resources Program at AFETA and both positions are responsible for compliance with all state and Federal laws and regulations (e.g., NEPA and SAIA) concerning natural resources. To achieve the natural resource management goals and objectives set forth by DOD and installation policy, the Environmental Manager uses an integrated approach focusing on identifying, restoring, and maintaining natural communities in support of the military mission and other sustainable activities through planning and management.

Natural resources management in many areas of AFETA is somewhat restricted by mission constraints with much of the area serving as building and operations, and explosive ordnance training areas where access is frequently

limited. The primary natural resource management issues identified on the installation are described in detail in Section 3, with management recommendations in Section 4.

1.6 COSTS AND BENEFITS

The benefits of this INRMP are numerous. For the military mission, the natural resources management program, as described in this INRMP, will ensure that the environmental conditions of the training lands continue to provide the continuous cover necessary for realistic military training. From an environmental perspective, implementation of this plan will maintain, protect, and enhance the ecological integrity of the training lands and the biological communities inhabiting them. In addition, the natural resources management program described in this plan will protect ecosystems and their components from unacceptable damage or degradation, and identify and restore already degraded habitats.

This plan will ensure that a diverse assortment of quality training lands will have an increased awareness of the potential for impacts to occur as a result of their activities. This heightened awareness will serve to minimize the possibility for impacts to occur, thereby decreasing the effort and costs that must be expended to mitigate those impacts.

The estimated average annual costs of implementing this INRMP by funding category are as follows:

- Forestry: $200,000
- Fish and Wildlife: $ 230,000
- Environmental: $ 1,250,000
- Training: $ 5,000

2.0 EXISTING CONDITIONS

The following chapter will discuss the existing conditions at AFETA which reflect the normal conditions on the installation and document the changes in existing conditions, if any for this 2017 – 2021 AFETA Integrated Natural Resources Management Plan.

2.1 LOCATION AND REGIONAL SETTING

AFETA is located on approximately 9,300 acres in the general vicinity of Williamsburg, in York County (8,932 acres) and James City County (342 acres), Virginia. The installation is generally bound by the York River to the east, Skimino Creek and Skimino Farms residential subdivision to the north, Interstate 64 to the west, and the tidal estuary of Queen Creek to the south (Figure 2-1). AFETA is located approximately 45 miles southeast of Richmond; approximately 5 miles east of Williamsburg; and approximately 16 miles northwest of Hampton.

South of the installation, across Queen Creek, two other Naval facilities are also located along the shoreline of the York River, Naval Supply Center Cheatham Annex and Naval Weapons Station Yorktown. The installation is surrounded by several parks, including New Quarter Park (545 acres) to the south, Waller Mill Park and Reservoir (2,705 acres) to the west, and York River State Park (2,550 acres) to the northwest. The remaining land use surrounding the installation includes residential development and Bruton High School. The closest suburban growth to the installation includes the waterfront subdivision of Queens Lake (south of the installation, adjacent to Queen Creek), Skimino Farms (northwest of the installation, adjacent to Skimino Creek), and Riverview Plantation (north of the installation).

2.2 INSTALLATION HISTORY

Prior to government acquisition, the land occupied by the installation supported small agricultural and watermen communities. Much of the land was cleared for agriculture during that time and many home sites dotted the landscape. Gradual abandonment of the agricultural land began in the early 1900s and much of the land began to revert to forest. In 1942, AFETA was established as a Seabee training facility, at which time it was the largest Naval establishment of its kind. Road building, demolition, amphibious landings, and other training activities were conducted on the installation. Building foundations, abandoned roads, and other infrastructure from this period are still evident throughout much of the forested areas of the installation. During World War II, the installation served as the United States (U.S.) Navy Training and Distribution Center. Under an agreement with the state, from 1946 to 1951, the area was used as a Virginia Department of Forestry (DOF) nursery and game reserve. Many of the lakes and ponds on the installation were created at this time to support game management. From 1951 to present, the installation has been owned by the Navy and leased to the DOD as an experimental training facility.

2.3 INSTALLATION LAND USE IN SUPPORT OF THE MILITARY MISSION

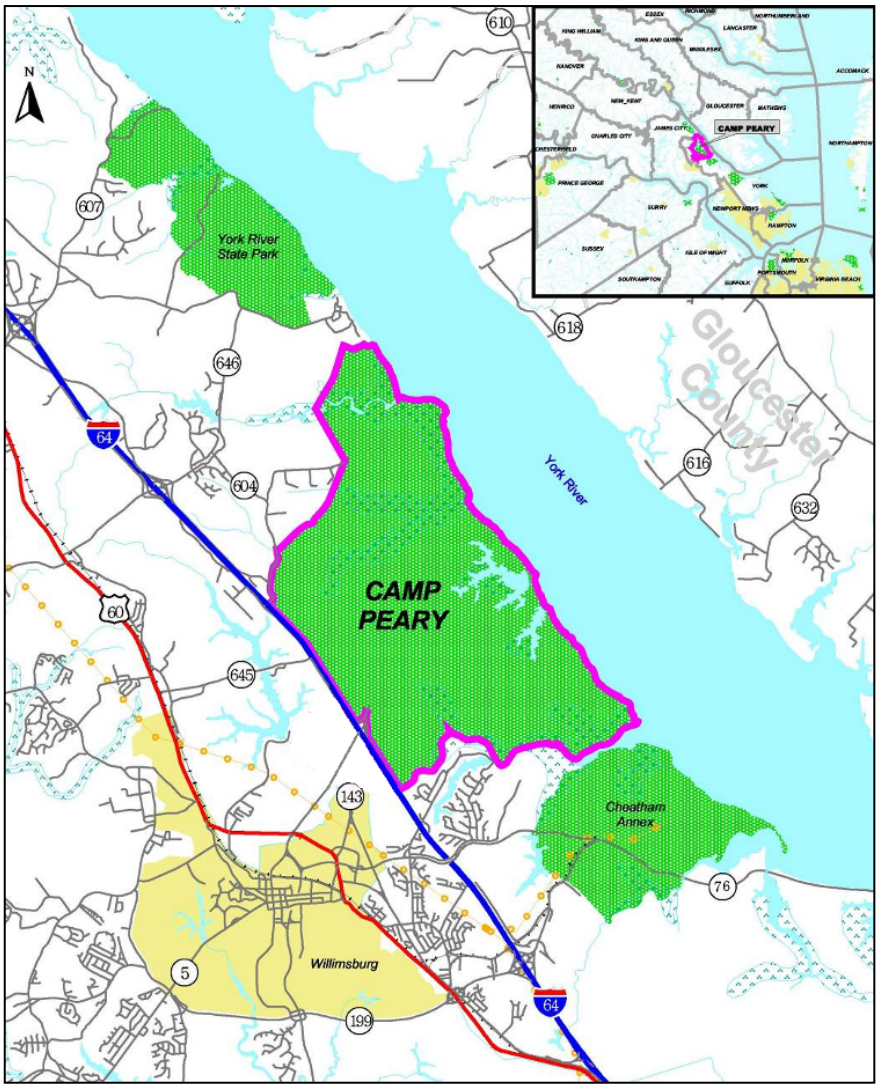
Approximately 8,000 acres of the total area encompassing AFETA is undeveloped or semi-developed land. The remaining land use acreage is composed of urban and residential development, or sites that are designated for military training use. The principal function of AFETA is to serve in the capacity of a military exercise and training facility to the combined Armed Forces. As part of the installation's overall mission needs, several development projects may take place during the five-year period covered by this INRMP. These projects include:

- construction of new dormitories and base training infrastructure with associated parking facilities;
- improvements to existing dormitories and base training infrastructure and associated parking facilities;

- construction of additional housing to support personnel management;
- improvements to basewide utility infrastructure;
- coordination with the Virginia Department of Transportation on the Interstate 64 Improvements;
- continued coordination with Yorktown Naval Weapons Station on natural resource management issues; and
- implementation of the Environmental Restoration Program.

All construction will be compatible with current AFETA Design Standards and all clearing limits will be minimized to the greatest extent practicable to accommodate the new facilities.

There are several clusters of development on the installation, mostly located on the higher elevations of the property. An administrative center is located on the north side of the installation, south of Powell Lake. In the center of the installation, there are several clusters of development along Williamsburg Road and Burma Road. A large housing area is located along the riverfront at the east end of Burma Road. Airfield and storage bunkers are located in the southern most portion of the installation.



Training on the installation is year-round and includes extended time courses, spread throughout the year. Training activities are quite diverse in scope, size, and duration throughout the installation; however, all military exercise and training activities are in accordance with the installation's overall mission needs and have a commitment to environmental protection, continual environmental improvement, and pollution prevention as outlined in this INRMP.

Figure 2-1: Regional setting of AFETA.

2.4 GENERAL PHYSICAL ENVIRONMENT

2.4.1 Topography, Geology, Soils

Topography & Geology

AFETA is located on the north edge of the James-York Peninsula, a landform defined by the York River to the north, the James River to the south, and rising topography (Figure 2-2) approaching the fall line to the west. The James-York Peninsula is situated within the Atlantic Coastal Plain Physiographic Province that stretches from Massachusetts to Florida. In general, the Coastal Plain is an area of low topographic relief extending from the Atlantic Ocean west to the fall line. East of the fall line, tidal forces affect the principal rivers and estuaries of the region, including the Potomac, Rappahannock, James, and York River (Figure 2-3).

Figure 2-2: Topography of AFETA.

The basement rock of the physiographic province is overlain by unconsolidated sediments of marine and fluvial origin that thicken and slope eastward (Oaks and Coch, 1973). The surface landscape consists of a series of broad, flat terraces and scarps associated with past cycles of marine transgression and regression. In particular, the installation is located on the Norfolk Formation, a fluvial-estuarine complex of cross-bedded medium to coarse sand, pebble gravel, silty sand, and laminated silty clays that was formed when sea levels were higher during the late Pleistocene and the York River was approximately twice as wide as it is today. As the waters receded, sandy fluvial deposits were created and can be found fronting major drainages in the area, such as the York River (Bick and Coch, 1969). The property contains upland formations at approximately 80 feet above mean sea level (MSL), stream terraces on the interior, and floodplains and marshlands that front the York River. Side slopes along most of the tributary streams and creeks are short and severe, providing a relatively clear geologic profile of the property. Elevations range between sea level and 80-90 feet above MSL. Nearly the

entirety of the installation can be found on the U.S. Geologic Survey (USGS) Williamsburg 7.5-minute Quadrangle Map (Quad), with the remaining portions on the Gressit and Clay Bank Quads.

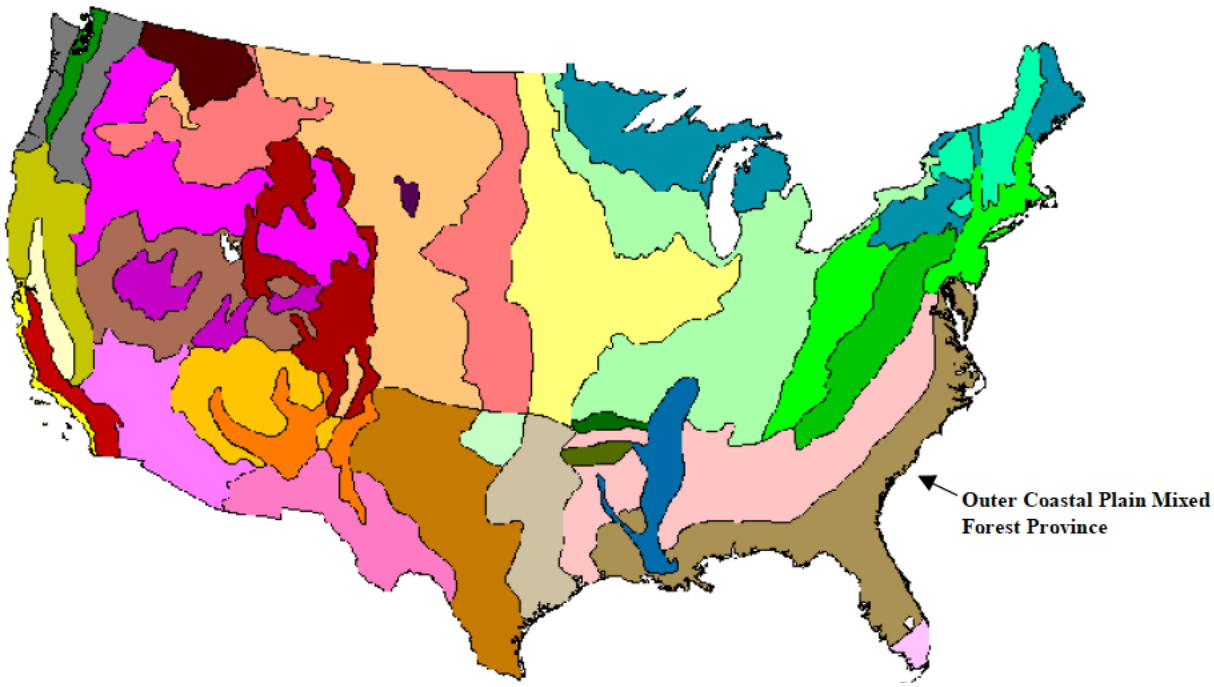


Figure 2-3: Outer Coastal Plain.

Soils

Predominant soils on installation uplands include Emporia, Kempsville, and Slagle Complex with associated Uchee soils, while the lower plains fronting the York River are mainly Dogue, Bojac, Slagle, Altavista, Pamunkey, and Munden complex soils (VPI, 1981). Although most of these soils are commonly acidic, the soil complexes on the installation have fair to good potential for farming and good potential for growing trees. The surface layers are friable and easily tilled, and likely proved attractive to prehistoric and historic settlement.

Table 2-1. Dominant soils on AFETA.

TYPE	*DESCRIPTION*
Emporia Complex	This soil complex consists of very steep well drained soils formed in sandy, loamy and clayey sediments of fluviomarine and marine origin. These soils are escarpment fronts and side slopes of drainage ways and terraces. Slopes are dominantly convex.
Kempsville Complex	The Kempsville series are very deep, well drained, and moderately permeable soils formed in loamy sediments on the upper Coastal Plain. Slopes are dominantly 0 to 6 percent but range to 25 percent.
Slagle Complex	Soils of the Slagle series are very deep and moderately well drained upland soil considered having a moderate erosion risk and a low shrink-swell potential. They have moderately slow or slow permeability. The soils formed in unconsolidated loamy fluvial and marine sediments on uplands of

TYPE	*DESCRIPTION*
	the upper Coastal Plain and are very strongly acidic. Slopes range from 0 to 6 percent.
Uchee Complex	The Uchee series consists of very deep, well drained, moderately slowly permeable soils that formed in sandy and loamy marine sediments. They are on smooth ridgetops and dissected side slopes of the Coastal Plain. Slopes range from 0 to 25 percent.
Dogue Complex	Soils of the Dogue loam series are very deep and moderately well drained considered upland soil considered having a moderate shrink-swell potential. They have moderately slow permeability. The soils formed in clayey alluvium and marine or fluviomarine deposits of the Coastal Plain. Slopes range from 0 to 15 percent.
Bojac Complex	Soils of the Bojac series are very deep and well-drained soil. They have moderately rapid permeability. The soils formed in loamy and sandy fluvial and marine sediments on. Slopes range from 0 to 10 percent.
Altavista Complex	Soils of the Altavista Fine Sandy Loam series consist of very deep, moderately well drained soils. Altavista soils are restricted to fluvial terraces with a slope range from 0 to 10 percent.
Pamunkey Complex	Soils of the Pamunkey series consist of well drained soils (seasonal high-water table 48 to 72 inches) in fine-loamy family on similar landscapes.
Munden Complex	Soils of the Munden series consist of moderately well drained soils (seasonal high-water table 18 to 30 inches) in on slightly lower landscapes.

Most of the soils found on the installation are moderately well drained, very fine sandy loams to sandy loams composed primarily of alluvial deposits underlain by marine sediments. Swamp muck and silt loams are in the tidal marshes along the larger streambeds and swamps. Bedrock is not exposed anywhere on the installation. The soils have been grouped into five general classifications of landscapes:

- *Soils on marshes and low terraces* (Bohicket, Axis, Levy). The soils of this association formed in water deposited material that range from muck to sandy clay loams. These soils are found mainly along the York River and Skimino, Carter, and Queen Creeks, and extend into some of the small tributaries. The soils are nearly level and waterlogged or flooded by tides daily or during high water. These soils are listed as hydric by the National Technical Committee for Hydric Soils (USDA, 1991). Hydric soils support wetland environments which provide important functions including water quality protection, shoreline erosion, flood prevention, and fish and wildlife habitat. In the upper part of the tributaries, the marshes containing these soils are brackish or fresh water. This association is best suited to wildlife management and conversation.

- *Soils on low river terraces* (Dogue, Bojac, Slagle, Altavista, Pamunkey, Munden). The soils of this association are deep, moderately well drained and well drained soils that have clayey and loamy subsoils. These soils are found mainly along the banks of the York River and Skimino, Carter, and Queen Creeks. River terrace soils are found mainly on broad to medium broad ridges that are not flooded and slight concave areas that are ponded for brief periods. The soils are mostly gently sloping or nearly level. Short steep and very steep slopes are common along drainage ways, small streams, and terrace breaks. This association is mostly wooded but some areas are being currently used or have been in the past for buildings.

- *Soils on Coastal Plain uplands, narrow to medium ridges, and steep side slopes* (Kempsville, Emporia, Slagle, Uchee). The soils of this association are deep, well drained, and moderately well drained soils that have loamy subsoils. This association is found on ridges that are intermediate between the river terraces and the broad gently sloping upland ridges. The topography of these soils is gently sloping ridges with steep and very steep side slopes generally located along drainage ways and small streams.

- *Soils on Coastal Plain uplands, medium to broad ridges, and steep side slopes* (Emporia, Slagle, Emporia Complex, Uchee). The soils of this association are deep, well drained and moderately well drained soils that have loamy subsoils. This association formed in loamy Coastal Plain sediments. Most of the area occupied by this soil association is wooded, but some areas are used for wildlife habitat plots. This is the second largest soil association found on base.

- *Soils on Coastal Plain steep side slopes and narrow ridges* (Emporia Complex, Uchee). The soils of this association are deep, excessively drained, well drained, and moderately well drained soils that have sandy, loamy, and clayey subsoils. This soil association is found along drainage ways. Topography is sloping to very steep and found on narrow winding ridges and very steep to very steep side slopes.

2.4.2 Climate

The region is classified as humid temperate and is typified by small to moderate annual temperature ranges (ftp://ftp.wcc.nrcs.usda.gov/support/climate/wetlands/va/511 99.txt). Summers are relatively hot and humid while winter conditions are cool with occasional brief cold periods.

Monthly rainfall distribution averages 3.64 inches with the highest amounts occurring between July and September, when average rainfall is approximately 5.09 inches per month. Snowfall is a relatively rare event, and only remains on the ground for short durations of time. The average annual snowfall depth is 6.4 inches per year and occurs generally between November and March. The record daily snowfall for the installation is 13.5 inches and occurred in 1980. The recognized growing season for the Williamsburg area (based on 28 °F) is 230 days between March 27 and November 12. Climate information is important because these conditions govern planting times and species selection for trees, shrubs, forbs, and grasses; determine migration and hibernation and/or aestivation periods of migratory and resident wildlife; are relevant in determining wetland hydrology under Section 404 of the Clean Water Act (CWA); and can be important in planning access to, and conducting timber harvests in wet areas.

2.4.3 Air Quality

Air pollutant emissions from AFETA are regulated under a State Operating Permit (Permit) issued by the Virginia Department of Environmental Quality (DEQ) under the requirements of the Federal Clean Air Act (CAA). AFETA Camp Peary operates under Virginia DEQ Registration Number 60276. The Permit regulates air pollutant emissions from boilers, generators, paint spray booths and gasoline loading and dispensing operations. The Virginia DEQ must be notified of any new air emission sources as part of the Permit to Construct prior to the sources being purchased. Open burning requirements are clearly defined in the Air Permit Management Plan (IEC, 2014).

2.4.4 Floodplain

The entire surface landscape of the installation consists of ridges dissected by a network of small low-order streams that drain into larger streams, including Queen Creek, Carter Creek, and Skimino Creek, which in turn empty into the York River and ultimately the Chesapeake Bay. The widths of the flood hazard areas associated with the York River, in general, are rather narrow when compared to those of other rivers in Virginia's Coastal Region. Streams and rivers in York County cut relatively deep channels. Wind tides produced by storm events are the most frequent cause of flooding in the county. The 100-year floodplain, which is the level at which a flood is likely to occur only once in a 100-year period, is used to evaluate flood hazard areas. The majority of the shoreline along the installation is located within the 100-year floodplain (Figure 2-4), as mapped by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, map panel numbers 5101820005B and 5101820030B.

2.4.5 *Surface Waters*

The installation is located within the York River Basin, between the Rappahannock River Basin to the north and the James River Basin to the South. The York River Basin lies in the central and eastern sections of Virginia with the headwaters located in Orange County, Virginia and flows approximately 120 miles in a southeasterly direction to the Chesapeake Bay. The hydrologic unit code (HUC) as defined by the Federal Hydrologic Unit System by the USGS for the York River is 02080107. This code represents the Mid-Atlantic Region (02), Lower Chesapeake Sub-region (08), Lower Chesapeake Accounting unit (01), and York Cataloging unit (07).

The main tributaries of the York River that cross the installation are Skimino Creek on the northern boundary of the installation, Carter Creek, Bigler Millpond, and Beaverdam Pond on the eastern boundary of the installation, and Queen Creek on the southern boundary of the installation (Figure 2-5). Skimino, Carter, and Queen Creeks have tidal salt marshes in their lower reaches and range from a few hundred feet to a few thousand feet in width. Haring Swamp, which drains into Queen Creek, is also located on the installation. There are five freshwater impoundments on the installation:

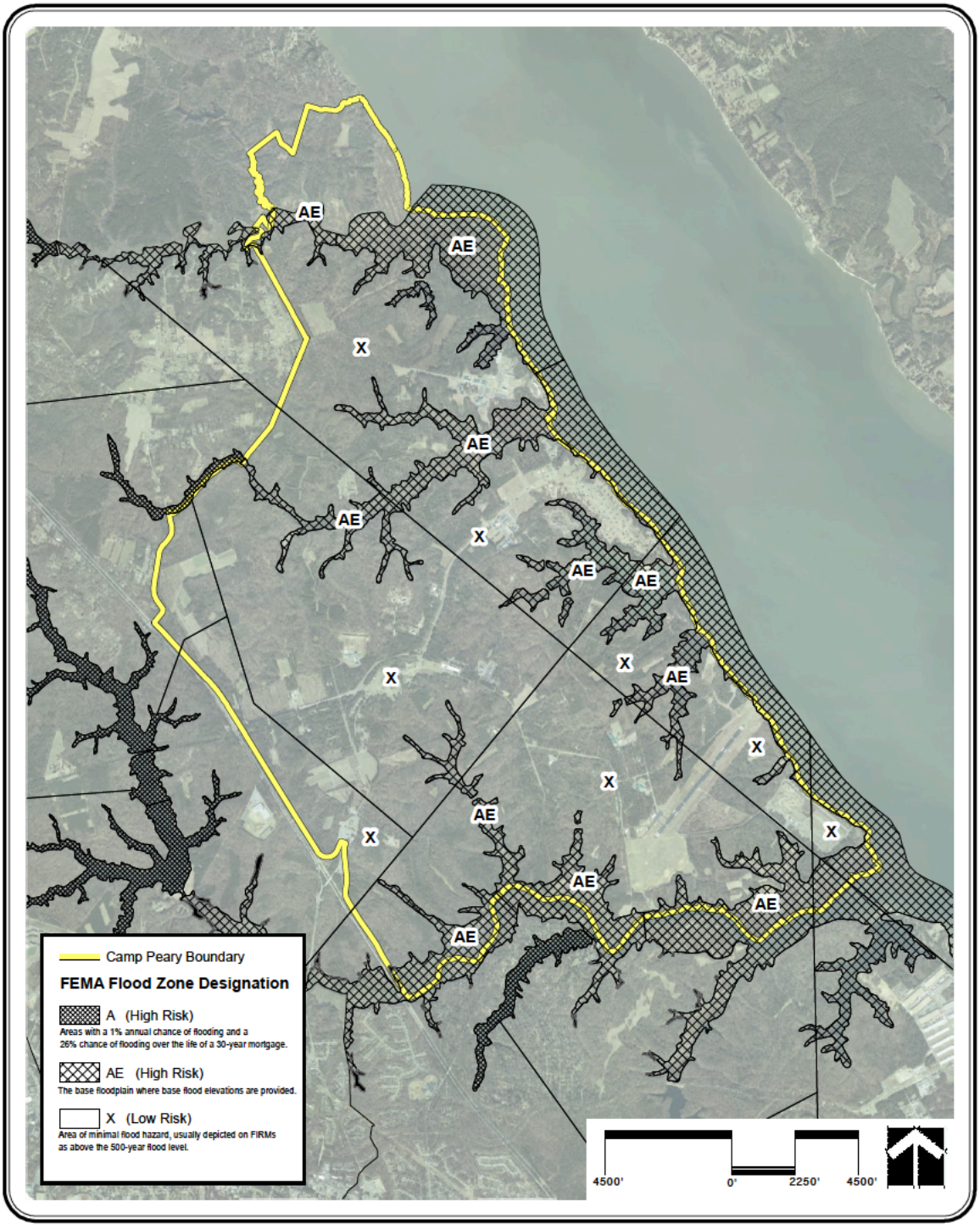
- Skimino Pond (16 acres),
- Powell Lake (16 acres),
- Bass Lake (3 acres),
- Bigler Millpond (140 acres), and
- Beaverdam Pond (49 acres).

The following list provides a description of all the surface waters found on the installation.

- York River – The York River is a navigable estuary, approximately 40 miles long, ranging in width from approximately 1 to 3 miles. The York River flows into the Chesapeake Bay approximately 11 miles downstream of the installation. Its watershed drains portions of 17 counties in the coastal plain of Virginia, north and east of Richmond. The basin is comprised of the York River and its two major tributaries, the Pamunkey and Mattaponi Rivers. The York River forms the eastern boundary of the installation, receiving runoff from all surface water on the installation. The 2012 DEQ 305b/303d Water Quality Assessment Integrated Report (WQAIR) identifies the portion of the York River along the installation as DEQ watershed F26, and is described as a mesohaline environment (an estuarine or brackish environment with salinity between 5-19 ppt). The water quality assessment identifies specific uses of the waterbody and determines if the water quality is not supporting or fully supporting of that use.

This reach of the river is classified as 5D, meaning the river is impaired for one or more designated uses, and that a total maximum daily load (TMDL) has been developed for some pollutants, however, a TMDL still remains to be developed for one or more pollutant. Water quality in this reach was determined to be fully supporting for the uses of recreation, shellfish, and wildlife. The uses for which water quality was determined to be not supporting were aquatic life and fish consumption. These impairments are primarily caused by excessive nutrients, a lack of dissolved oxygen, polychlorinated biphenyls (PCBs) in fish tissues, and an abundance of aquatic macrophytes. These causes are a result of sediment deposition, point source and stormwater discharge, loss of riparian habitat, and internal nutrient recycling within the waterbody. Additional sub-uses for which water quality was found to be not supporting include open water and shallow water submerged aquatic vegetation. These impairments are due to low summer dissolved oxygen and water clarity acreage requirements.

- Skimino Creek – The headwaters of Skimino Creek lie between the cities of Lightfoot and Norge along Route 60 (Richmond Road). The total drainage area of Skimino Creek is approximately 8.19 square miles (5,241.6 acres). The approximately 560 acres of the installation draining into Skimino Creek are largely undeveloped and are primarily used for wildlife and timber management. Skimino Creek is tidally influenced throughout its reach on the installation. According to the 2012 WQAIR, Skimino Creek has been classified as 4A, meaning the river is impaired for one or more designated uses, and a TMDL for criteria pollutants has been developed. Water quality in this reach was determined to be not supporting for the uses of aquatic life, shellfish and wildlife. These impairments are primarily caused by excessive nutrients and a lack of dissolved oxygen. Shellfish use is impaired due to the Virginia Department of Health (VDH) Department of Shellfish Sanitation (DSS) shellfish direct harvesting condemnation, in place since August 24, 2005. Additional sub-uses for which water quality was found to be not supporting include open water and shallow water submerged aquatic vegetation. These impairments are due to low summer dissolved oxygen and water clarity acreage requirements.



- Carter Creek – Carter Creek originates near Burke's Corner in the city of Lightfoot, to the west of the installation, and bisects the installation before ultimately draining into the York River. The base contributes to approximately two-thirds (approximately 2,730 acres) of the total Carter Creek drainage area. Ninety percent of the drainage area to Carter Creek on the installation is forested, with the remainder characterized by operational facilities and agricultural food plots.

- Haring Swamp – Haring Swamp drains approximately 870 acres of the installation to Queen Creek. This drainage area is comprised primarily of forested areas and housing developments. The lower portion of Haring Swamp consists of a tidal salt marsh community while the upper reaches of the swamp contain a bottomland hardwood community.

- Queen Creek – Queen Creek forms the southern boundary of the installation and receives drainage from approximately 2,900 acres of the installation, entering from Haring Swamp. Queen Creek is a tidal and navigable waterway until the upper reaches where a dam is located at Waller Mill Reservoir. According to the 2012 WQAIR, Queen Creek has been classified as 5D. Water quality in this reach was determined to be not supporting for the uses of aquatic life, fish consumption, recreation, and shellfish. These impairments are primarily caused by excessive nutrients, a lack of dissolved oxygen, PCBs in fish tissues, and an abundance of aquatic macrophytes. Shellfish use is impaired due to the VDH-DSS shellfish direct harvesting condemnation, in place since July 16, 2010. The condemnation zone is in effect for most of the creek, with the exception of the first approximately 0.5 mile at the mouth of the creek. Additional sub-uses for which water quality was found to be not supporting include open water and shallow water submerged aquatic vegetation. These impairments are due to low summer dissolved oxygen and water clarity acreage requirements.

- Bass Lake – Bass Lake is considered an esthetic and recreational resource which is located adjacent to the Base Club building, along the York River shoreline. It has a small contributing drainage (less than 50 acres) and is not identified as a potential stormwater management (SWM) feature. It is used for primarily recreational fishing and wildlife habitat.

- Beaverdam Pond – The drainage area of Beaverdam Pond is approximately 690 acres and the pond has a storage capacity of 178 acre-feet. This pond has been identified as a potential SWM feature for the base. The pond contains an outlet structure that allows the water level to be manipulated from a normal pool depth of three to five feet of water to a completely drained state.

- Bigler Millpond – Bigler Millpond was created by damming a small tidal tributary to the York River in the 1950s. The drainage area of Bigler Millpond is approximately 975 acres and the pond has a storage capacity of 555 acre-feet. This pond has been identified as a potential SWM feature for the base. The pond is used primarily for recreational purposes, such as boating and fishing.

- Powell Lake – Similar to Bigler Millpond, Powell Lake was also created by damming a small tidal tributary to the York River in the 1950s. It is located north of the administration complex and received approximately 40 percent of stormwater runoff from that area. The lake has a drainage area of approximately 120 acres with a storage capacity of 101 acre-feet. The pond is used primarily for recreational purposes, such as boating and fishing.

- Skimino Pond – Skimino Pond was created by damming a small tidal tributary of Skimino Creek in the 1950s. The lake has a drainage area of approximately 201 acres, with a storage capacity of 104 acre-feet. The pond is used primarily for recreational purposes including boating, fishing, and wildlife watching.

The pond lies along the installation multiuse trail. Due to the lack of current development in this area, this pond has not been identified as a potential SWM feature for the installation.

2.4.6 Shoreline Management Plan

In 2016, AFETA completed a re-evaluation of their existing *Shoreline Management Plan* to update the existing conditions, erosion rates, and management strategies from the baseline study *Shoreline Management Plan* completed in September 2013. The *Shoreline Management Plan* provides guidelines for the management of AFETA tidal shoreline in accordance with state and federal regulations, regional initiatives, and DOD policies on environmental stewardship and ecosystem management. This plan identifies shoreline reaches of concern along the York River and Queen Creek shorelines at AFETA and provides management recommendations to stabilize the shoreline and prevent continued erosion pursuant to the Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. § 1451 *et seq.*) and Virginia's Coastal Zone Management Program (VCP). This Shoreline Management Plan will provide for a stable and functional shoreline that supports the mission requirements of the installation.

As part of the installation's efforts to evaluate and prioritize their shoreline management program, the following studies were also completed and serve as reference for *Shoreline Management Plan*:

- *Dam Safety Inspections – Beaverdam Pond Dam (NID No. VA 19907)* (US Army Corps of Engineers Norfolk District; November 2016)
- *Dam Safety Inspections – Bigler Mill Pond Dam (NID No. VA 19908)* (US Army Corps of Engineers Norfolk District; November 2016)
- *Dam Safety Inspections – Powell Lake Dam (NID No. VA 19909*) (US Army Corps of Engineers Norfolk District; November 2016)
- *Dam Safety Inspections – Skimino Pond Dam (NID No. VA 19910*) (US Army Corps of Engineers Norfolk District; November 2016)
- *AFETA Camp Peary Engineering Conditions Survey of Pond Embankment and Spillway Structures, Skimino Pond, Powell Lake, Bass Lake, Bigler Mill, and Beaverdam Ponds* (Gannett Fleming, 2007); and the
- *Shoreline Management Plan for AFETA Camp Peary* (2013).

Seven reaches were identified, totaling 2.8 miles of shoreline (Figure 2-6). Areas of shoreline not identified as reaches of concern at this time are:

- areas which were observed to have low or minor erosion where there is no existing or planned upland development within close proximity to the shoreline and
- areas where there is no conflict between planned land use and the condition of the bank.

Multiple shoreline stabilization projects over the life of the installation, such as rip rap revetments and breakwater systems, are providing erosion control along much of the York River shoreline. Overall, areas with existing protection were observed to be in good condition, with these areas showing signs from low erosion to very low accretion. Generally, areas showing the greatest signs of erosion were those not currently protected.

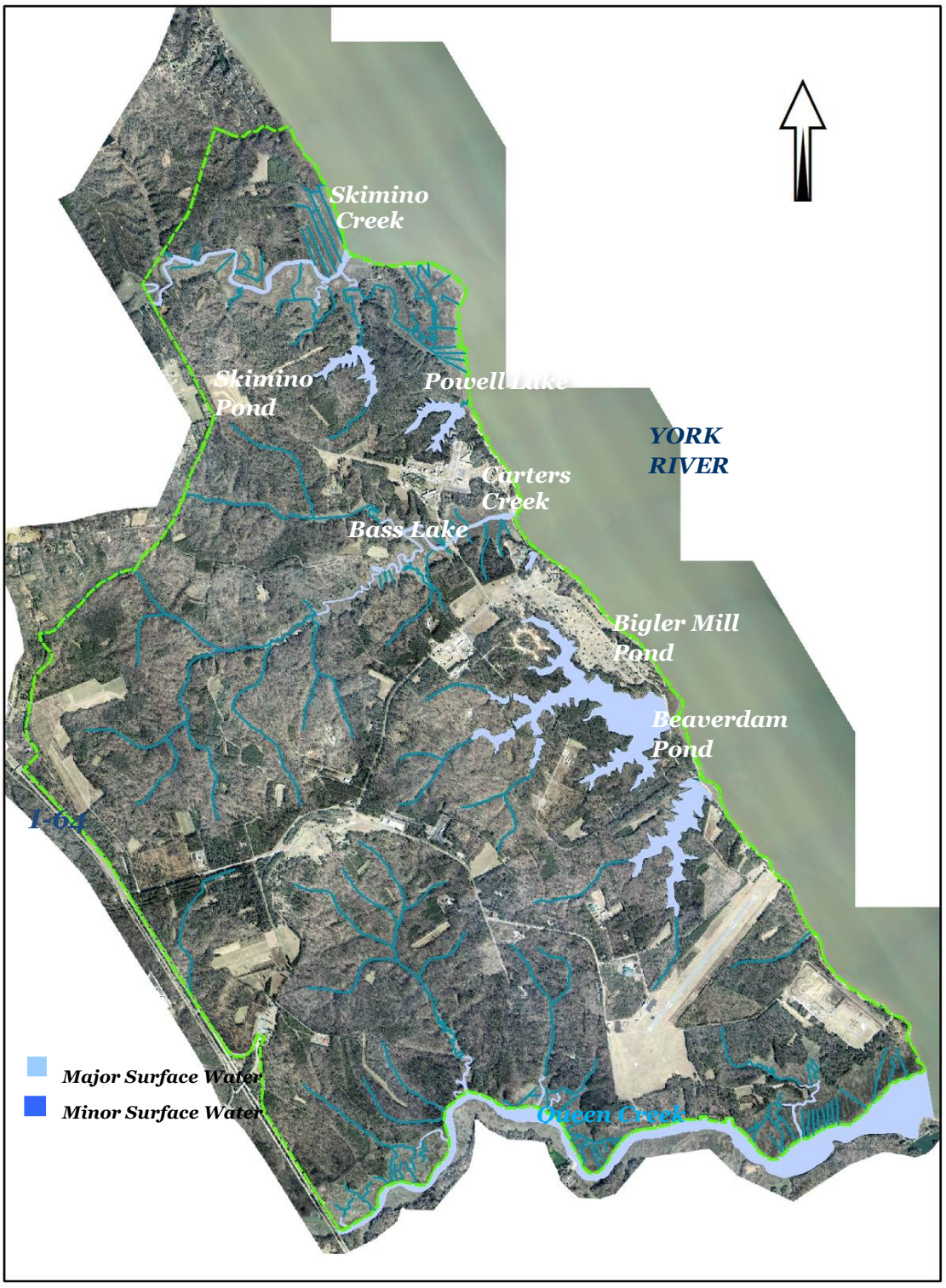


Figure 2-5: Surface waters of AFETA.

Figure 2-6: Shoreline reaches evaluated as part of the Shoreline Management Plan.

Expansive salt marsh systems are observed along Queen Creek, Skimino Creek and Ferry Point, with less extensive salt marsh areas observed along the shores of Bigler Millpond, Beaverdam Pond, as well as the entrance to Carter Creek. Additionally, fringe wetlands are identified along the York River shoreline. The general management recommendations highlighted below may be appropriate for use in these low-very low erosion areas.

- Remove dead and dying trees from the bank to prevent potentially significant amounts of soil from being stripped from the bank when the trees fall into the water.
- Prune large overhanging limbs that can potentially shade out wetland grasses. Doing so will increase sunlight and encourage vegetation growth, further stabilizing the bank.
- Remove storm debris, including wood, trash, limbs, and wrack to avoid smothering wetland plants.
- Plant vegetation where appropriate to increase the size of the marsh.
- Use fiber logs, such as coir logs or other bio logs, to absorb wave energy and provide protection for vegetated areas.

Table 2-1 outlines the summary of priority levels assigned to each reach and the updated recommendations based on changes to shoreline conditions from the 2013 to 2016 period. Overall, the major recommendation was to establish survey benchmarks at each of the reach locations in order to better monitor for erosion. In addition, the

summary includes US Army Corps of Engineers (USACE) recommendations for specific reach locations to further protect existing dam structures located along the York River shoreline.

Table 2-2. Summary of Shoreline Management Plan Recommendations

Reach	Priority (2013)	Recommendation (2013)	Priority (2016)	Recommendation (2016)
1	High	Evaluate the need to bolster the existing dam structure to prevent undermining of the dam foundation. Continue offshore breakwater system, from downstream, past dam, to stabilize existing marsh and protect the dam foundation.	Medium	USACE Recommendations: perform a subsurface engineering evaluation and develop an emergency action plan. 2016 Recommendation: Establish benchmarks and monitor for erosion.
2	Medium	Establish benchmarks and monitor for erosion.	Medium	2016 Recommendation: Establish benchmarks and monitor for erosion.
3	Medium	Establish benchmarks and monitor for erosion.	Medium	2016 Recommendation: Establish benchmarks and monitor for erosion and routinely monitor gabion baskets for deflation and conduct periodic maintenance of these structures to account for deterioration, rising sea level and increases in storm surge.
4	High	Bolster existing dam structure to prevent undermining of foundation. Establish offshore breakwater system to stabilize existing marsh and protect dam foundation.	High	USACE Recommendations: clear and grub the length of the entire dam and reseed with grass; place an additional 12 – 18 inches of stone on the upstream face above existing rip-rap for length of dam; retrofit the dam to include an auxiliary spillway and a low-level drain; and develop an emergency action plan. 2016 Recommendation: Establish benchmarks along the reach and routinely monitor along the wetland edge for increased erosion.
5	High	Armor unprotected sections through revetment or breakwater system.	Medium	2016 Recommendation: Establish a general maintenance plan to monitor and re-position sloughing rock after large storm events.
6	High	Continue with construction of living shoreline system.	Low	2016 Recommendation: Construction of living shoreline is complete. Continue vegetation monitoring as required by the regulatory requirements.
7	Medium	Grade bank and expand marsh with vegetative plantings.	Medium	2016 Recommendation: Grade bank and expand marsh with vegetative plantings.

2.4.7 Range 37 Shoreline Monitoring Update

In 2012, AFETA received regulatory authorization to stabilize approximately 1,100 linear feet of actively eroding shoreline along the York River in the proximity of Range 37 with the construction of four (4) offshore breakwaters with associated beach nourishment and restoration of approximately 17,938 SF (0.41 acres) of vegetated tidal wetland and Spartina marsh creation. Per the requirements of the permit authorizations, re-vegetation of the shoreline occurred through the restoration of approximately 17,938 SF (0.41 acres) of vegetated tidal wetland. The areas behind the breakwaters were planted with a combination of smooth cordgrass (*Spartina*

alterniflora) and salt meadow hay (*Spartina patens*), on 1.5 foot spacing. No bank grading was completed as part of this project due to the potential presence of unexploded ordnance and small arms ammunition associated with historic training activities.

Since 2012, AFETA has completed monitoring of the restoration site in order to document the health and vitality of the system. In general, the planted sprigs are healthy at 12 – 30 inches tall with no signs of dead or decaying material. Sprig density was noticeably improved with individual sprigs at a width of generally 4 inches. The site can be characterized as having a natural wrack deposition line due to the daily tidal conditions. There were no areas of erosion within the planted or self-mitigating areas of the project area. In the southernmost portion of the project site, *Phragmites australis* (Common Reed) is present. Phragmites is an erect, aquatic or sub- aquatic, perennial grass with an extensive rhizome system. Phragmites plants are highly competitive and usually form dense (>100 shoots m^2), mono- specific stands. The root system is adapted to anaerobic conditions via tissue which can provide gas exchange from the leaves. It develops the combination of a thick, un- branched root into the substrate and smaller, branching roots through the water and top layers of the sediment, optimizing access to available nutrients. The roots, rhizomes and stem bases may comprise up to 80% of total biomass. Phragmites has few natural enemies and none have been thoroughly evaluated for host specificity.

In 2016, AFETA performed corrective measures to begin to control the growth and spread of the identified Phragmites. Control treatments may include spraying herbicides, mowing, discing, bulldozing, crushing, shading, dredging, flooding, draining, burning, and grazing. AFETA Natural Resources determined that an herbicide application would be the most suitable treatment for this location. AFETA Natural Resources applied a Glyphosate (Rodeo) solution in October 2016. It is intended that a second application will be applied in October 2017.

For the AFETA Range 37 Shoreline Stabilization – Year 3 Monitoring Report (2017), the vegetative aerial cover of *Spartina alterniflora* and/or *Spartina patens* equated to 73.2%. The planted site does not currently meet the performance criteria of a minimum of 75% aerial coverage of *Spartina alterniflora* and/or *Spartina patens*. However, this data was collected at the end of three years of growth after initial planting and vegetation monitoring will be completed during the June and September 2019 growing season per the permit authorizations. The site is exhibiting signs of healthy vegetative cover and improved growth to date.

2.4.8 Groundwater

AFETA is located in the North Atlantic Coastal Plain aquifer system. The Northern Atlantic Coastal Plain aquifer system consists of six regional aquifers in sedimentary deposits that range in age from Early Cretaceous to Holocene. The western limit of the aquifer system is the landward edge of water-yielding Coastal Plain strata where they pinch out against crystalline rocks of the Piedmont Physiographic Province at the fall line. Although the aquifers included in the aquifer system extend beneath the Atlantic Ocean and, in places, contain brackish water or freshwater under nearshore parts of the Continental Shelf, the eastern limit of the aquifer system is, for all practical purposes, the shoreline.

The Northern Atlantic Coastal Plain aquifer system grades southward into the Southeastern Coastal Plain aquifer system. The aquifers and confining units that underlie the Coastal Plain vary considerably in thickness. Much of this variation is because the sediments that contain these hydrologic units were deposited on an irregular crystalline rock surface that was warped by tectonic forces so as to form arches that alternate with troughs or

embayments. The sediments that compose the Northern Atlantic Coastal Plain aquifer system were deposited in non-marine, marginal marine, and marine environments. Lower Cretaceous sediments were deposited mostly by streams in alluvial and deltaic environments. From Late Cretaceous through early Tertiary time, a series of marine transgressions covered most of the Atlantic Coastal Plain, and shallow marine to marine environments prevailed. A general regression of the sea began during late Tertiary time, when non-marine Miocene sediments were deposited in New Jersey and parts of Maryland. Post-Miocene sediments are mostly Quaternary non-marine clastic rocks. Except for the surficial aquifer, which is named for its location at the land surface, the name applied to each regional aquifer is taken from one or more of the geologic formations or groups that compose the aquifer. Groundwater drinking water wells are located within a one mile radius of AFETA (VDH Office of Drinking Water) at private residences located outside the northern installation boundary.

2.4.9 Stormwater

AFETA has a Storm Water Management Master Plan (SWMMP) (Baker SWMMP, 2004) which examined the existing conditions on the installation and address base-wide development for future conditions. The goal of the master plan is to serve as a general planning tool for the development of AFETA. In general, the report examined water quality and water quantity issues for the 2-, 10-, and 100- year storm events and determined requirements for stormwater management or water quality treatment to support future development. In addition, the report investigated the four existing ponds for use as potential stormwater management facilities (SWMF) and provided recommendations on future SWMF locations. Placement of required SWMF will not occur in sensitive areas including wetlands or waters of the US.

The Virginia Stormwater Management Act covers control of water quality, stream channel erosion, and flooding and includes the following requirements:

- The site must be in compliance with the Chesapeake Bay Preservation Act (CBPA) in terms of water quality.
- The site must be below the average impervious land cover of 16% to be exempt from water quality treatment. If the site increases in impervious area and is above the average land cover, a Best Management Practice (BMP) must be implemented conforming to the Virginia Stormwater Management Program (VSMP) Permit Regulations, January 29, 2005.
- The site must also be in compliance with Minimum Standard 19 (MS-19), stating properties and receiving waterways downstream of any land development shall not be subject to erosion and damage due to an increase in stormwater volume, velocity, and runoff.
- Man-made channels should have the capacity to hold the 10-year storm within its banks and should produce non-erosive velocities for the 2-year storm.
- Natural channels should have the capacity to hold the 2-year storm within its banks and should produce nonerosive velocities for the 2-year storm as well.

As part of the engineering design and planning process, AFETA officials will ensure properties and receiving waterways downstream of any land development project will be protected from erosion and damages due to increases in volume, velocity, and peak flow rates of stormwater runoff on a project-by-project basis. AFETA accomplishes this by implementing Low Impact Development design techniques such as:

- Encouraging groundwater recharge
- Minimization and disconnection of impervious surfaces
- Tree preservation
- Minimized clearing and grading

- Open space design
- Vegetated open channels

As part of AFETA's storm water management practices, the Department of Public Works generally completes the following inspections in order to properly maintain all base SWMFs:

- Inspect drainage channels base-wide periodically and repair any areas of erosion.
- Maintain records of development activity within any of the 12 watersheds and document for record keeping. This will allow AFETA to track compliance with this Stormwater Management Master Plan.
- Inspect existing stormwater management facilities periodically to ensure they are maintained in a good condition in accordance with the VSMP.

AFETA construction projects follow all requirements and regulations as stated in the VSMP as regulated by the VDEQ. The VSMP seeks to protect properties and aquatic resources from damages caused by increased volume, frequency and peak rate of stormwater runoff. Further, the program seeks to protect those resources from increased nonpoint source pollution carried by stormwater runoff.

> *Quantity of Stormwater Runoff* - Pervious surfaces, such as meadows and woodlands, absorb and infiltrate rainfall hence generates little runoff. Urban landscape typically covers such areas with impervious surfaces, such as pavement and rooftops. These impervious surfaces generate runoff every time it rains. The quantity of runoff from these areas quickly overwhelms natural channels and streams, often causing channel erosion, localized flooding and property damage.
>
> *Quality of Stormwater Runoff* - The pervious and impervious surfaces in the urbanizing landscape collect pollutants such as automobile oil, grease, brake pad dust, sediment from construction sites, bacteria from animal waste, excess lawn care fertilizers and pesticides, as well as atmospheric deposition of phosphorus, nitrogen and other airborne pollutants. Rainfall washes these surfaces so that the initial flush of runoff can carry high concentrations of these pollutants to nearby drinking water supplies, waterways, beaches and properties. Pollution washed from the land surface by rainfall is called nonpoint source pollution.

The State of Virginia is an authorized state under the federal permitting program. The Virginia Department of Environmental Quality (DEQ) administers the federal program pertaining to the construction activities as part of the VSMP permit program, which is authorized under the Virginia Stormwater Management Act. As mandated by the Clean Water Act and EPA's Phase 1 (11/16/90) and Phase 2 (12/8/99) stormwater regulations, the federal permitting requirements have been incorporated into the Permit Regulation in sections 4 VAC50-60-380 and 390.

DEQ's construction site stormwater permits are based upon Environmental Protection Agency's (EPA) construction stormwater general permit, and require construction site operators to develop and implement a stormwater pollution prevention plan (SWPPP) that uses BMPs for erosion and sediment control at the construction site. Permits for construction sites do not typically contain monitoring requirements; however, they do require the operator to regularly inspect stormwater discharges from the site to ensure that the best management practices are controlling the discharge of pollutants to the maximum extent practicable, and are meeting water quality standards.

Construction activities equal to or larger than one acre are required to apply for registration coverage under the General Permit for Discharges of Stormwater from Construction Activities. Construction activities larger than less than one acre will be reviewed on a case by case basis to determine if the plans require submittal to DEQ for erosion and sediment control requirements.

In addition, construction activity (i) of less than one acre yet part of a common plan of development or sale disturbing one or more acres, and (ii) having the potential to discharge stormwater, requires coverage under the VSMP General Permit for Discharges of Stormwater for Construction Activities pursuant to 4 VAC 50-60-10.

AFTEA is not currently required to obtain any water quality operation or discharge permits because there are currently no processes occurring on base which discharge wastewater to state waters or Waters of the U.S. In addition, AFETA is not currently classified as a facility which requires an industrial storm water discharge permit or municipal separate storm sewer system (MS4) permit pursuant to the VSMP permit program.

DOD Chesapeake Bay Program

AFETA participates in the yearly DOD Chesapeake Bay Program (DOD CBP) Annual Best Management Practice Datacall. DOD CBP requests installations within the Chesapeake Bay watershed to complete an annual datacall by reporting projects that support the protection and restoration of the Chesapeake Bay. The information is used for reporting to the Environmental Protection Agency, Bay Jurisdictions, the Deputy Assistant Secretary of the Navy (Environment) as the Lead Agent for DOD in Chesapeake Bay related matters and other program partners throughout the year.

2.5 GENERAL BIOTIC ENVIRONMENT

2.5.1 Wetlands

Wetlands can generally be described as areas that are covered by water or have waterlogged soils for long periods during the growing season and can support wetland vegetation. Section 404 of the CWA (33 U.S.C. § 1251 et seq.) assigns jurisdiction of wetlands to the USACE and defines wetlands as “those areas that are inundated or saturated by surface water or ground water 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.” To be delineated as a wetland, an area must exhibit three characteristics: hydric soils, dominance of hydrophytic vegetation, and hydrology.

As part of the planning process for all projects, wetland determinations within the project areas are completed utilizing National Wetlands Inventory (NWI) mapping from the USFWS and field investigations in accordance with requirements stated in the Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1 (January, 1987). In the event AFETA project plans may impact or affect wetland habitats, a jurisdictional verification must be conducted and all appropriate permits sought from USACE for any soil disturbing activity within the jurisdictional area if appropriate.

AFETA is composed of approximately 980 acres of wetlands that include areas of estuarine, lacustrine, and palustrine wetlands (Figure 2-7). Wetlands are found throughout AFETA with the majority of jurisdictional areas located along the main tributaries of the York River, such as Skimino Creek on the northern boundary of the installation, Carter’s Creek, Bigler Mill Pond, and Beaverdam Pond on the eastern boundary of the

installation, and Queens Creek on the southern boundary of the installation. In general, the following types of wetlands have been identified on AFETA (Figure 2-7):

- PFO - Palustrine Forested Deciduous
- PEM - Palustrine persistent emergent
- PSS - Palustrine Scrub-Shrub
- PUB - Palustrine Unconsolidated Bottom
- PAB - Palustrine Aquatic Bed Rooted Vascular
- E2EM - Estuarine intertidal persistent emergent
- E2USM – Estuarine Intertidal Flat, Irregularly Exposed
- E1UBL – Estuarine Subtidal Unconsolidated Bottom
- E2SS – Estuarine Intertidal Scrub/Shrub Wetland
- L1UBL – Lacustrine Unconsolidated Bottom

The three types of wetlands are discussed in further detail below.

Estuarine Wetlands

There are three primary vegetated estuarine wetlands: emergent wetlands, salt marshes, and brackish tidal marshes. Emergent wetlands are dominated by herbaceous plants and in the case of marshes, exist in permanently saturated and regularly flooded soils along rivers or creeks. Salt marshes characteristically lie behind barrier islands and beaches along sea coasts in relatively high salinity waters. Brackish tidal marshes are located upstream in coastal rivers where seawater is diluted by freshwater (ground and storm water) and fluctuates with the tides, river flow and seasons. With decreasing salinity in the brackish tidal marsh, the emergent plants that characterize the marsh become more diverse.

There are four major estuarine wetland types on or bordering the installation, as classified by the Virginia Marine Resources Commission (VMRC): saltmarsh cordgrass community, big cordgrass community, cattail community, and brackish water mixed community. The majority of estuarine wetlands on the installation represent two major vegetative communities, the saltmarsh cordgrass community (low marsh) and big cordgrass community (*Spartina cynosuroides*), both of which are tidal salt marsh. Tidal wetlands are defined as those vegetated or unvegetated, lands bordering, or lying beneath, tidal waters which are subject to regular or periodic tidal action. These two vegetative communities have the highest primary productivity of wetland types and are vital for wildfowl and wildlife habitat. Tidal marshes also play a vital role as fish and shellfish spawning and nursery areas.

Tidal marshes serve as the buffer between rivers adjacent uplands, and are effective in dissipating wave energy thereby helping to protect the shoreline from erosion. There are four main estuarine wetland areas on the installation.

- Queen Creek marsh – Queen Creek marsh is dominated by several plant communities and therefore is referred to as a brackish water mixed community. The marsh hosts a wide range of plant life including saltmarsh cordgrass and salt meadow hay adjacent to Queen Creek, big cordgrass and pockets of black needlerush in the middle marsh, and wax myrtle (*Myrica cerifera*) and salt bush (*Ilex opaca*) along the marsh-upland interface.

- Skimino Creek marsh – From the mouth of Skimino Creek to where the creek branches, the marsh is largely dominated by saltmarsh cordgrass. The smaller branches of Skimino Creek are comprised of big cordgrass, cattails and saltmarsh cordgrass.

- Carter Creek marsh – The Carter Creek marsh is dominated by saltmarsh cordgrass. The uppermost Carter Creek marsh is characterized primarily as a freshwater marsh.

- York River marsh – There are three types of fringing marshes along the York River: big cordgrass, brackish water mixed community and saltmarsh cordgrass.

Palustrine Wetlands
Palustrine wetlands include the nontidal, vegetated wetlands or open water habitats less than 20 acres in size or less than 6.6 feet in depth and must have salinity below 0.5 parts per million (ppm). Palustrine forested and emergent wetlands occur throughout the installation in conjunction with the widespread network of streams. Palustrine wetlands can be composed of a variety of vegetation types, including emergent, scrub/shrub, and forested. On AFETA, the palustrine wetlands are primarily composed of broadleaved deciduous forested species including red maple (*Acer rubrum*), American sycamore (*Plantanus occidentalis*), swamp chestnut oak (*Quercus michauxii*), green ash (*Fraxinus pennsylvanica*), and are temporarily or seasonally flooded.

The primary source of hydrology for palustrine wetlands located on the installation is groundwater. Many of these wetlands have developed in the floodplains of the headwaters to the creeks and streams where the seasonal water table approaches or intersects the forest floor. These wetland systems can support diverse scrub/shrub and herbaceous vegetation layers with plant species unique to wetlands in addition to the forest canopy.

Lacustrine Wetlands
Lacustrine wetlands include freshwater ponds that are greater than 20 acres in size or less than 6.6 feet in depth at low water. Lacustrine areas are located along the boundaries of four of the five freshwater impoundments on the installation: Skimino Pond, Powell Lake, Bigler Millpond, and Beaverdam Pond. In shallower areas of these ponds, rooted aquatic plants can generally be found.

2.5.2 Water Quality Buffers
The Chesapeake Bay Preservation Act was adopted by the Virginia General Assembly in 1988. The protection of the public interest in the Chesapeake Bay, its tributaries, and other state waters and the promotion of the general welfare of the people of the Commonwealth require that: (i) the counties, cities, and towns of Tidewater Virginia incorporate general water quality protection measures into their comprehensive plans, zoning ordinances, and subdivision ordinances; (ii) the counties, cities, and towns of Tidewater Virginia establish programs, in accordance with criteria established by the Commonwealth, that define and protect certain lands, hereinafter called Chesapeake Bay Preservation Areas, which if improperly developed may result in substantial damage to the water quality of the Chesapeake Bay and its tributaries; (iii) the Commonwealth make its resources available to local governing bodies by providing financial and technical assistance, policy guidance, and oversight when requested or otherwise required to carry out and enforce the provisions of this chapter; and (iv) all agencies of the Commonwealth exercise their delegated authority in a manner consistent with water quality protection provisions of local comprehensive plans, zoning ordinances, and subdivision ordinances when it has been determined that they comply with the provisions of this chapter.

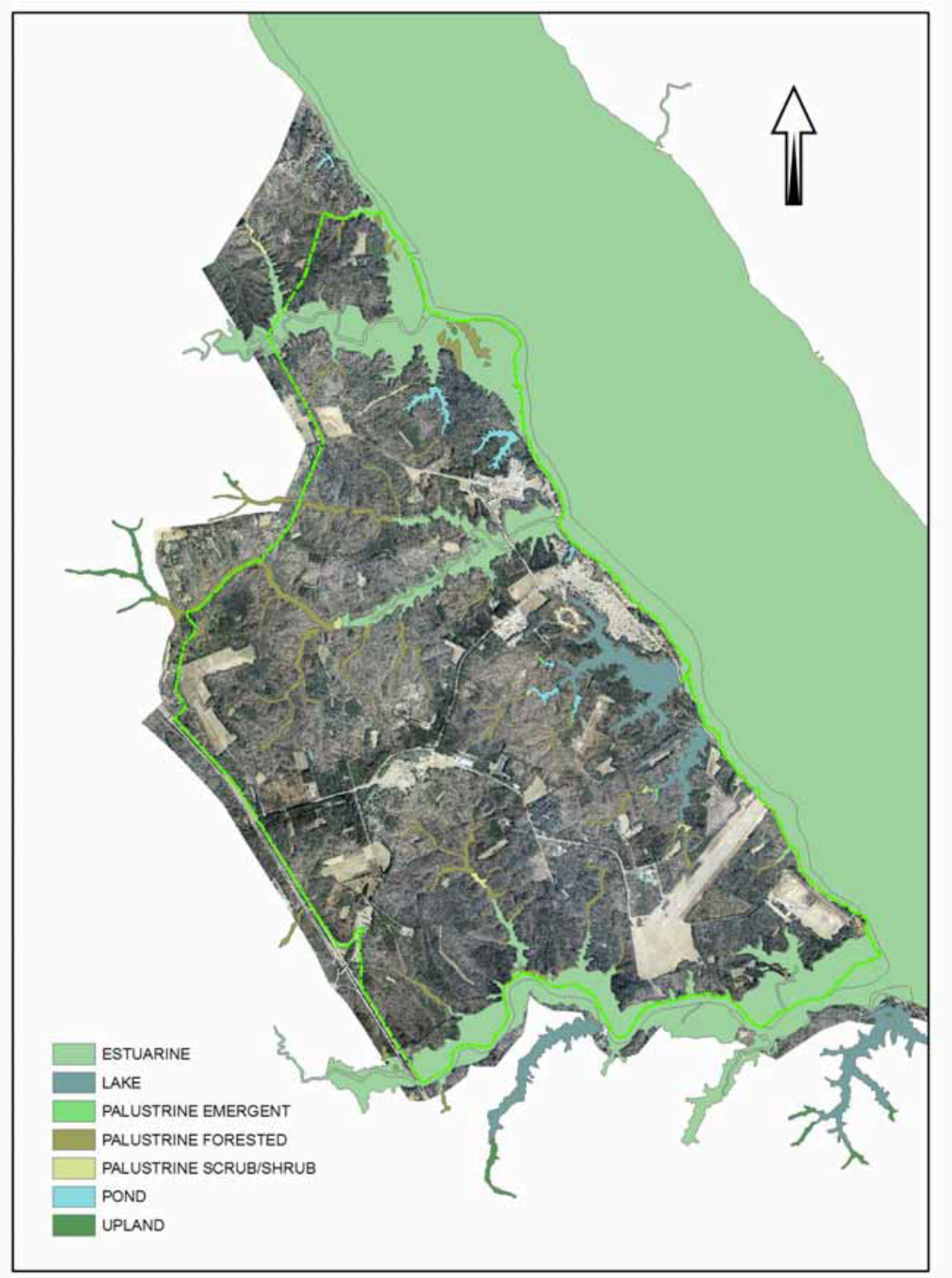


Figure 2-7: Wetlands identified on AFETA.

A Chesapeake Bay Preservation Area (CBPA) is an area delineated by a local government in accordance with criteria established pursuant to § 10.1-2107. Chesapeake Bay Protection Areas include two components, the Resource Protection Area (RPA) and the Resource Management Area (RMA).

- RPA includes tidal wetlands; non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow; tidal shores; other lands designated by individual localities; and a vegetated buffer at least 100 feet wide located adjacent to and landward of these components, as well as along both sides of any water body with perennial flow.
- RMA includes floodplains, highly erodible soils, including steep slopes; highly permeable soils, non-tidal wetlands not included in the RPA and other land designated by individual localities.

A Cooperative Agreement between the DOD and the EPA concerning Chesapeake Bay activities states that the DOD will "design, construct and locate new development in a manner that will minimize its impact on the Chesapeake Bay and its tributaries and in consonance with the President's goal of no net loss of wetlands". The Chesapeake Bay Preservation Area Designation and Management Regulations, revised in March 2002, provide guidance for local government designation of CBPAs. To the extent practical, AFETA will abide by these regulations which will protect and improve the water quality of the Chesapeake Bay.

2.5.3 Vegetation

Approximately 7,000 acres of indigenous vegetation, including three primary associations of wetlands (riparian forest, estuarine emergent wetlands, and palustrine wetlands) occur within unimproved and semi-improved areas on the installation. The distribution of these vegetation associations is linked to topography and hydrology. The primary vegetative cover types include mixed pine, hardwood forest, and non-tidal wetlands.

Forest Community

Environmental legislation including the Department of Defense (DOD) Natural Resources Management Program (32 Code of Federal Regulations [CFR] Part 190) and the Sikes Act Improvement Act (16 U.S. Code [USC] §670a-f), require an integrated natural resources management plan (INRMP) be developed for all military installations with significant natural resources. Forest inventories provide valuable information regarding the condition, health, and productivity of a forest and allow for informed management decisions. A thorough forest inventory typically records physical characteristics such as forest type, age, height, site index for the dominant species, and size class. These data are used to determine stand density, basal area, timber volume, and other forest characteristics. In addition to these factors, fuels data including the depth of duff and leaf litter and the occurrence of woody debris can be used to develop fire behavior models and evaluate the risk of wildfire in an area. Forest management is an integral part of natural resources planning and is a required component of the INRMP. Naval Facilities Engineering Command – Mid-Atlantic (NAVFAC MIDLANT) and AFETA contracted Versar, Inc. to conduct a forest inventory to inform and support forest management at AFETA (*AFETA Camp Peary Forest Inventory (Final June 2017*).

AFETA encompasses approximately 9,200 acres, of which approximately 8,000 acres are undeveloped. Approximately 70 percent (6,079 acres) of the installation is comprised of managed forestland (*AFETA Camp Peary Forest Inventory (Final June 2017*). The remaining acreage is urban, residential, forested recreational area, forested buffer, and mission training areas.

A comprehensive forest inventory of AFETA was previously conducted in 1999 (*U.S. Navy 2000*). During the 1999 forest inventory, the installation was divided into 10 forest compartments and 202 forest stands totaling approximately 6,500 acres. A forest management plan, developed in 2005 (*AFETA Camp Peary 2005*), re-delineated forest stand boundaries and compartments to consolidate forest stand prescriptions in response to an

extensive amount of hurricane damage in 2003 and to reflect changes in land use, including new housing areas and new mission requirements. A total of 144 stands totaling 6,195 acres were delineated for the 2005 mapping effort within the same 10 compartments. At the time, approximately 40 percent of the forest stands at AFETA are dominated by pine and 60 percent was hardwood-dominated. The stands were divided by forest cover type, with 1,491 acres of hardwood, 2,235 acres of hardwood/pine, 1,208 acres of pine, 1,228 acres of pine/hardwood, and 33 acres of non-forested that require restoration. There was no lower size limit to the forest stands and stands ranged from 0.5 to 305 acres.

The current inventory, conducted from November 2016 to April 2017, re-delineated forest stand boundaries and compartments to consolidate forest stands, with a minimum stand size of 10 acres, and to reflect changes in stands due to past management activities and land use. The nine compartment boundaries were drawn primarily along the creeks and streams that divide the installation landscape and limit operability and secondarily along major roads. The current inventory establishes new stand boundaries with a total of 125 stands totaling 6,079 acres (Figure 2-8). One goal of establishing new stand boundaries was to limit the minimum stand size to ten acres and to base the boundaries on physical features such as roads, trails, and streams. The new stand boundaries reflect current forest types (Table 2-3) and provide a sound representation of conditions at AFETA, which will be used by the NAVFAC MIDLANT forester and installation natural resources manager to make informed decisions on management including forest restoration, pest control, wildland fire management, and timber sales. These data can also be shared with the Virginia Department of Forestry (DOF) and Virginia Department of Game and Inland Fisheries (DGIF) Virginia Department of Conservation and Recreation (DCR), and United States Department of Agriculture (USDA) Forest Service (USFS) to foster partnerships and increase their understanding of forest conditions and flora and fauna habitat in the region.

The forest inventory (*AFETA Camp Peary Forest Inventory (Final June 2017*) delineates forest stands that will be actively managed by the AFETA Forestry Program. Some areas were excluded from the inventory as they provide forested buffers for developed areas, roadways, training areas, and recreation areas. These areas will be managed in conjunction with other base programs to provide a variety of benefits. Special attention must be given to the aesthetic, historical, archaeological, biological, and recreational requirements of an area, within or outside the forest stand. Zones that may be included in forest stands that should be left as buffers include:

- Intact forested area around ranges and other training facilities to provide visual, noise, and security buffers;
- Recreational area zones of 100-150 feet surrounding picnic areas, nature trails, and tennis courts;
- Urban zones of 100-200 feet surrounding housing areas, individual residences, office buildings, and other high-use buildings;
- Streamside management zones (SMZs) of at least 50 feet on streams and wetlands;
- Pond zones of 100 feet from the edges of ponds and lakes; and
- Bald eagle (*Haliaeetus leucocephalus*) or other sensitive plant or animal species' management zones as determined by the VDGIF, VDCR Natural Heritage Program, and/or the U.S. Fish and Wildlife Service (USFWS).

On military installations, the military mission and public health and safety are paramount considerations. AFETA has many past and present training areas and target range areas that have restricted access. Most of these areas are not excluded from forest management. Two areas, identified as hazardous due to military munitions and munition debris, were excluded from the forest inventory. One of these areas, consisting of four stands, was included in the

stand delineation to allow the forester to incorporate inventory data, once access restrictions are reduced and data is collected.

Table 2-3. AFETA Total Acres of Forest Type within Each Forest Compartment

Compartment	Number of stands	Stand Area (Acres)
1	2	195.6
2	14	765.0
3	11	445.9
4	18	915.7
5	7	225.3
6	16	807.5
7	33	1,540.4
8	15	827.0
9	9	357.1
Grand Total	**125**	**6,079.4**

The installation's hardwood forests include uplands and forested wetlands that occur in the drainage areas. The upland hardwood forests are generally older and represent a later stage in ecological succession than the pine stands. These stands are primarily located in the more isolated central and northern portions of the installation. Though these stands are in good condition, minimal active management has been undertaken to encourage their regeneration and, except for areas of natural disturbance, there is little diversity in age structure or size class. The forested wetland areas are dominated by a variety of bottomland hardwood species. These areas will be set aside as riparian buffers during forest harvesting operations.

For a general overview, forest type can be looked at in terms of the forest type representing the relative percentage hardwood and pine basal area. The forest composition has shifted from 60-percent hardwood dominance, in 2005, to 75 percent in 2016 (AFETA 2005). Currently, AFETA forest acreage is dominated by hardwood (44 %) and mixed hardwood/pine (31%) (Figure 2-9). Relatively pure pine (10%) and/or mixed pine/hardwood (15%) acreage is less prevalent. Figure 2-10 illustrates the extent and location of these stands at AFETA.

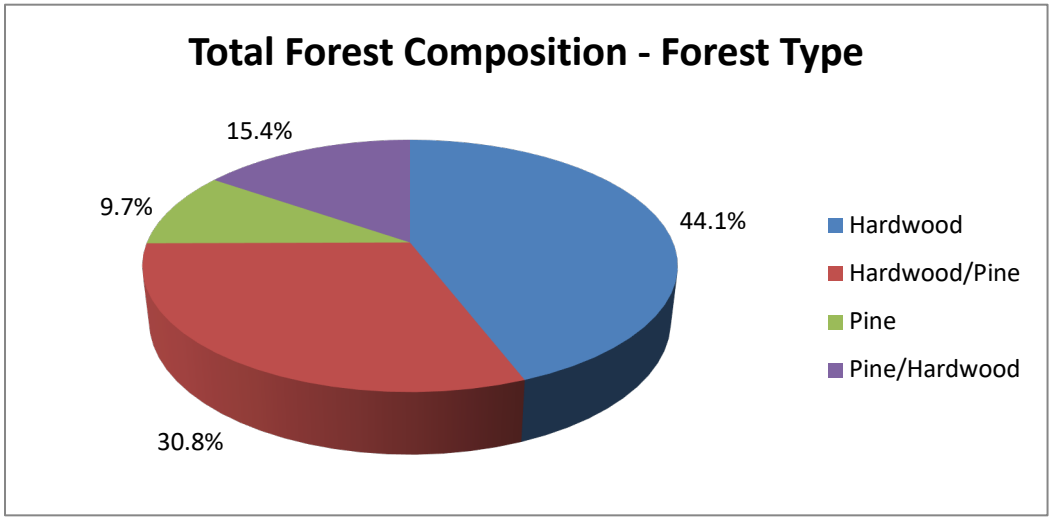


Figure 2-8: Total forest composition by forest type (AFETA Forest Inventory (Final June 2017).

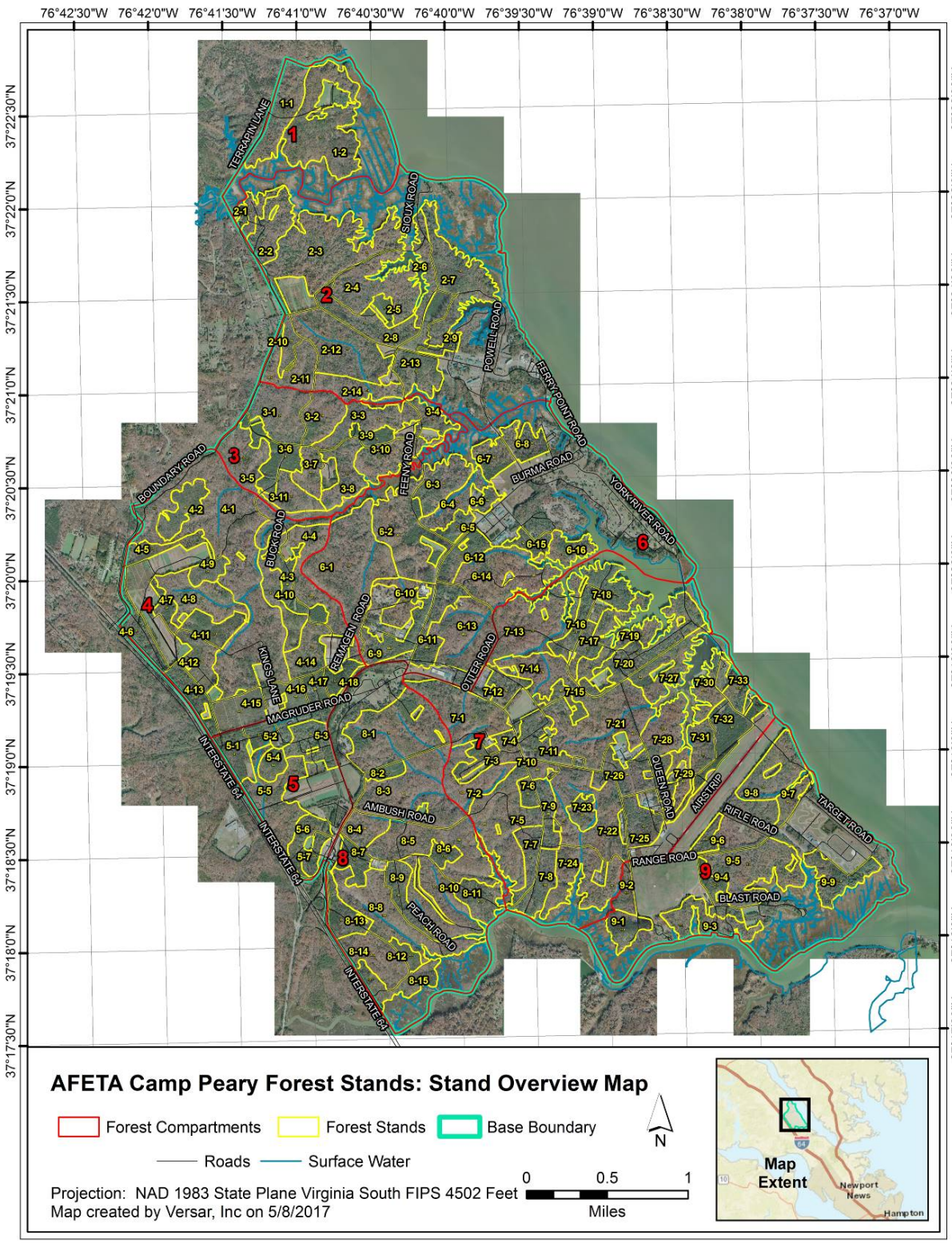


Figure 2-9: Forest stands identified on AFETA (AFETA Camp Peary Forest Inventory (Final June 2017).

Currently, AFETA forests are composed of mostly larger timber. Over 90 percent of the stands were classified as saw timber. Recent forest management activities and storm damage occurring over the last 10-15 years resulted in the creation of several seedling and sapling stands, comprising approximately 2 percent of the forest stands, and shelterwood/seedtree cuts, comprising 2 percent of the stands. The percentage of pulpwood (1 percent) and pine chip-n-saw (4 percent) stands gives an indication of the extent of forest management that has occurred in the last 15-30 years (Figure 2-10).

Pine stands at AFETA are primarily comprised of loblolly pine (*Pinus taeda*) with lesser amounts of Virginia pine (*Pinus virginiana*) scattered throughout. Virginia pine is a small to medium sized tree, which easily colonizes disturbed areas. This species' small size and wood defects make it an undesirable species for timber production. Its short, kinked needles and poor natural pruning are identifying characteristics. Loblolly pine is typically larger than Virginia Pine and is a more desirable timber species because of its natural pruning ability and straight growth habit. Because loblolly pine also has a faster growth rate, is longer lived, and responds to thinning better than Virginia pine, it should be favored over Virginia pine in forest treatments. Pine is best managed through an even age management system. It may be regenerated through clear-cutting and planting, seed tree cuts, or shelterwood system.

Common hardwoods include white oak (*Quercus alba*), chestnut oak (*Quercus montana*), southern red oak (*Quercus falcata*), northern red oak (*Quercus rubra*), black oak (*Quercus velutina*), yellow poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), American beech (*Fagus grandifolia*), mockernut hickory (*Carya tomentosa*), and red maple (*Acer rubrum*). Past land uses and forest management practices, as well as natural disturbances, such as hurricanes, have influenced the type and condition of the forests that occur.

Other species that were recorded in a range of habitats at AFETA, but are either unimportant timber species or were observed in low numbers, include black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), American hornbeam (*Carpinus caroliniana*), sourwood (*Oxydendrum arboreum*), common persimmon (*Diospyros virginiana*), sassafras (*Sassafras albidum*), Eastern redcedar (*Juniperus virginiana*), pin oak (*Quercus palustris*), and flowering dogwood (*Cornus florida*). American holly (*Ilex opaca*) is found in the understory of most stands.

Timber Volume

Timber volume is a good estimate of the productivity of forested sites. Saw timber volume is measured in thousand board-feet (MBF) and converted to tons. A board-foot is defined as one square foot, one inch thick, or 144 cubic inches. Pulpwood volume is measured in tons. A total timber volume of 429,812.6 tons was inventoried at AFETA (Table 2-4). Approximately half (213,482.5 tons) of the volume is saw timber and half (216,330.1 tons) is pulpwood. Of the pulpwood, 42,141.5 tons is pine and 174,188.5 tons is hardwood. Of the saw timber, 129,489.0 tons is pine and 83,993.5 tons is hardwood. The saw timber volume equates to 27,746.9 MBF of pine and 22,424.4 MBF of hardwood (Figure 2-11).

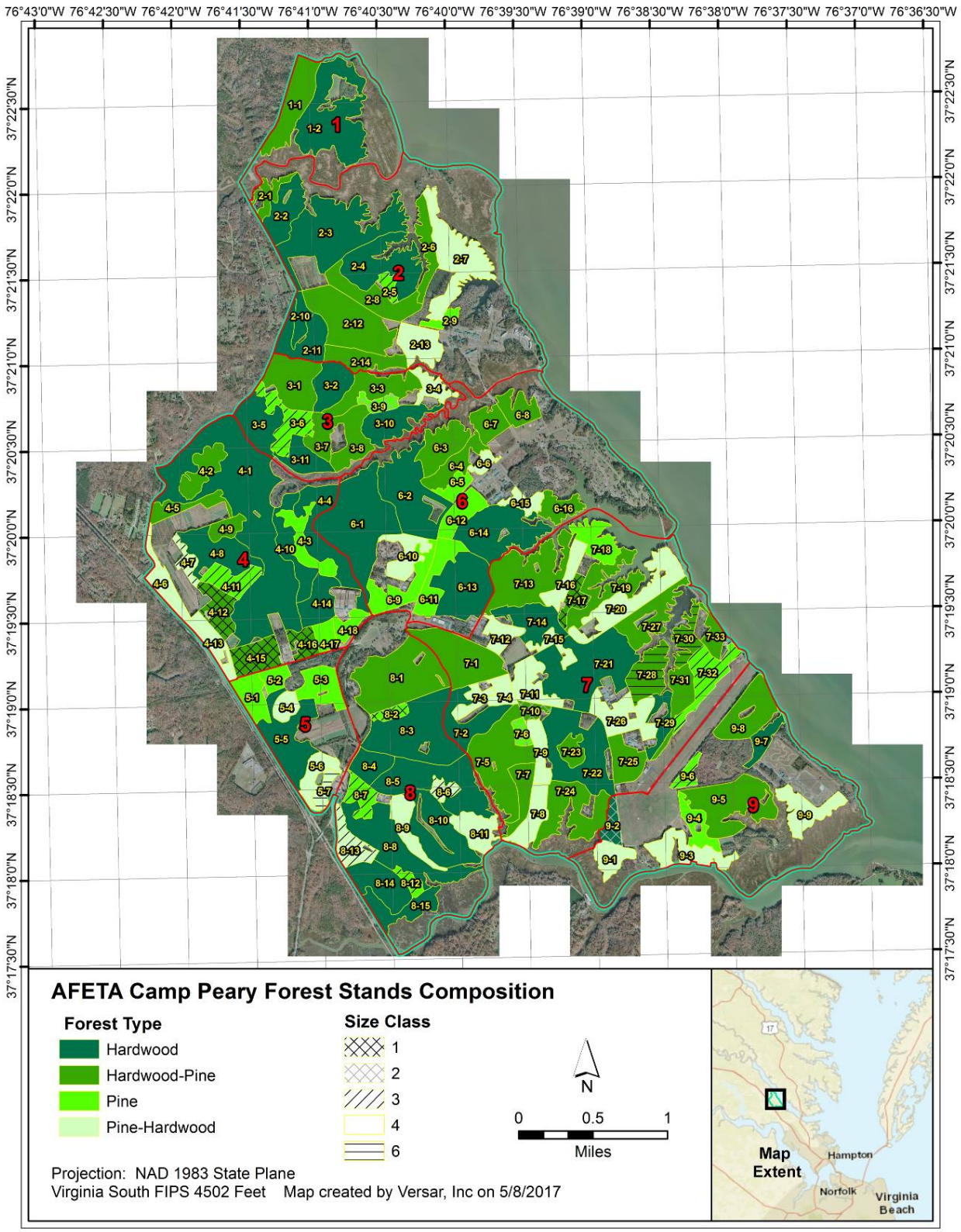


Figure 2-10: Forest stand composition identified on AFETA (AFETA Camp Peary Forest Inventory (Final June 2017).

Table 2-4. AFETA Total Volume for Forest Products within each Compartment

Compartment	Acres	Pine Saw Timber Volume (Tons)	Hardwood Saw Timber Volume (Tons)	Pine Pulpwood Volume (Tons)	Hardwood Pulpwood Volume (Tons)	Total Volume (Tons)
1	195.6	4,071.1	4,259.5	1,779.3	10,559.8	20,669.7
2	765.0	13,869.8	12,117.0	3,502.0	21,308.9	50,797.7
3	445.9	6,163.6	4,884.2	4,134.0	11,291.0	26,472.8
4	915.7	19,010.8	11,381.5	7,250.3	25,410.6	63,053.1
5	225.3	10,298.2	2,315.7	3,381.9	5,641.3	21,637.1
6	807.5	11,445.5	9,343.3	3,533.3	18,067.0	42,389.0
7	1,540.4	39,155.3	20,455.6	11,027.9	42,466.3	113,105.1
8	827.0	14,310.4	14,957.4	4,611.6	29,272.9	63,152.3
9	357.1	11,164.3	4,279.3	2,921.4	10,170.6	28,535.6
Grand Total	**6,079.4**	**129,489.0**	**83,993.5**	**42,141.5**	**174,188.5**	**429,812.6**

Pine saw timber volume exceeds any individual hardwood species in every compartment and exceeds combined hardwood saw timber volume in all compartments except compartment 1. Poplar has the second greatest volume in six compartments, exceeded only by white oaks in compartments 2, 3, and 6. Compartment 7, the largest compartment, has the greatest total hardwood pulpwood volume in each forest product category. Hardwood pulpwood has the highest volume total in every compartment except compartment 5 and 9.

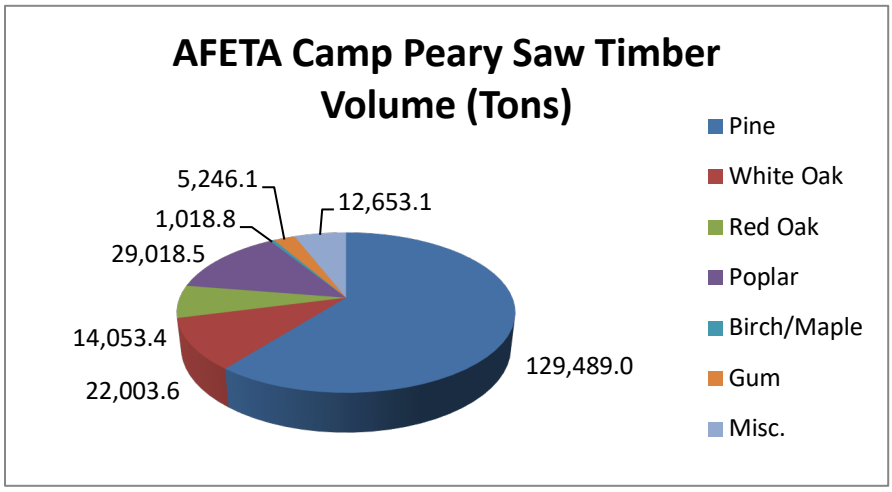


Figure 2-11: Saw timber volume by species (AFETA Forest Inventory (Final June 2017).

Mid-story and Under-story Community

Dominant shrubs include wax myrtle (*Morella cerifera*), mountain laurel (*Kalmia latifolia*), American beautyberry (*Callicarpa americana*), common pawpaw (*Asimina triloba*), and ericaceous shrubs such as blueberry (*Vaccinium* spp.) and huckleberry (*Gaylussacia* spp.) species. Other common plants found throughout the installation include Devil's walkingstick (*Aralia spinosa*), Virginia creeper (*Parthenocissus quinquefolia*),

grape vine (*Vitus* spp.) greenbrier (*Smilax* spp.), blackberry (*Rubus* spp.), partridgeberry (*Mitchella repens*), ebony spleenwort (*Asplenium platyneuron*), and Christmas fern (*Polystichum acrostichoides*).

Herbaceous Community

These areas range from one to 90 acres in size. Ground cover in many of these communities often consists of a carpet of clover, alfalfa, fescue, sunflower, wheat annual ryegrass, and buckwheat. In addition, ground cover consists of two non-native grasses, microstegium (*Microstegium vimineum*) and joint-head arthraxon (*Arthraxon hispidus*). Switch cane (*Arundinaria gigantea*) is also prevalent in the herbaceous understory of mixed pine and hardwood stands, as is dog fennel (*Eupatorium leptophylum*). Important vine species that are found in most of these communities include poison ivy (*Toxicodendron radicans*), several greenbriar species (*Smilax spp*.), Japanese honeysuckle (*Lonicera japonica*), yellow jasmine (*Gelsemium sempervirens*), and Virginia creeper (*Parthenocissus quinquefolia*). Dominant species in palustrine emergent wetland areas include softrush (*Juncus effusus*), common reed (*Phragmites australis*), woolgrass (*Scirpus cyperinus*), coast cockspur (*Echinochloa walteri*), warty panic grass (*Panicum verrucosum*), and swamp loosestrife (*Decodon verticilatus*). There are saplings of sweetgum and red maple in these areas as well.

Landscaped Areas

The urban landscape on the installation consists of mature trees, ornamental shrubs, and mowed grassy areas. The principal lawn grasses are generally German Millett and Annual Ryegrass. Best management practices follow the suggested specifications and minimum standards which outline regional and seasonal varieties most suited for the landscape in our region. Most of the urban trees are residuals from natural stands that were preserved during building construction. The tree and shrub species most commonly found on the installation's improved and semi-improved areas include several species of oaks, cedars, dogwoods, sweetgum, yellow poplar, holly, and azalea.

Invasive Species

A large number of invasive, non-native species occur on sites that were previously developed or disturbed by military training or other land uses throughout much of the forested area. These species generally became established on old home sites, abandoned training areas, and wildlife food plots and are now spreading throughout large portions of the installation. Invasive species documented at AFETA include (Table 2-5):

Table 2-5. Invasive vegetative species identified on AFETA.

Common Name	*Scientific Name*	*Status*
Tree-of-heaven	*Ailanthus altissima*	highly invasive
Privet	*Ligustrum japonicum*	highly invasive
Japan Grass	*Microstegium vimineum*	highly invasive
Common reed	*Phragmites australis*	highly invasive
Kudzu	*Pueraria Montana*	highly invasive
Autumn-olive	*Elaeagnus umbellate*	highly invasive
Multiflora rose	*Rosa multiflora*	highly invasive
Mimosa	*Albizia julibrissin*	moderately invasive
English ivy	*Hedera helix*	moderately invasive
Wisteria	*Wisteria sinensis*	moderately invasive
Japanese honeysuckle	*Lonicera japonica*	moderately invasive
Periwinkle	*Vinca major and Vinca minor*	moderately invasive
Golden bamboo	*Phyllostachys aurea*	moderately invasive

Executive Order 13112 was signed establishing the National Invasive Species Council which requires that a Council of Departments dealing with invasive species be created. EO 13112 and other pertinent statutes provide a framework for agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. Each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law to use relevant programs to

- prevent the introduction of invasive species;
- detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner;
- monitor invasive species populations accurately and reliably;
- provide for restoration of native species and habitat conditions in ecosystems that have been invaded;
- conduct research on invasive species and develop technologies to prevent introduction and
- provide for environmentally sound control of invasive species; and
- promote public education on invasive species and the means to address them.

2.5.4 Wildlife

AFETA supports a wide variety of fish and wildlife species providing habitat for many species of small mammals, birds, reptiles, amphibians, and fish. Approximately 8,000 of the approximately 9,300 acres are undeveloped and provide a diversity of habitats to support fauna that is characteristic of southeastern Virginia. The installations' wetlands and ponds provide migrating waterfowl and fish spawning areas and habitat with year-round habitat for many fauna species. There is an abundance of various mammal species, bird species, amphibians, reptiles, fin fish and shellfish species that are known or potentially occur on the installation and in adjacent waters (Appendix C).

Mammals

The general mammalian fauna of the province includes white-tailed deer (*Odocoileus virginiana*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), cottontail rabbit (*Sylvilagus floridanus*), marsh rabbit (*Sylvilagus palustris*), gray squirrel (*Sciurus carolinensis*), opossum (*Didelphis virginiana*), common mink (*Mustela vison*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), river otter (*Lutra canadensis*), long-tailed weasel (*Mustela frenata*), eastern mole (*Scalopus aquaticus*), hispid cotton rat (*Sigmodon hispidus*), white footed mouse (*Peromyscus leucopus*), marsh rice rat (*Oryzomys palustris*), meadow vole (*Microtus pennsylvanicus*), pine vole (*Microtus pinetorum*), and eastern harvest mouse (*Reithrodontomys humilis*). Introduced species include Norway rat (*Rattus norvegicus*), and house mouse (*Mus musculus*). The striped skunk (*Mephitis mephitis*) and red fox (*Vulpes vulpes*) are common to most of the southeast and coastal plain areas of eastern Virginia.

Most of the above species are found in the forest habitats of AFETA. However, the hispid cotton rat, eastern harvest mouse, and house mouse are commonly found in upland old field or early successional habitats. The meadow vole may be found in marshy meadows, bogs, and occasionally in upland old field habitat. The marsh rice rat prefers open wetlands such as marshes and vegetated agricultural field ditches. The pine vole prefers woodland habitats with lots of herbaceous cover and leaf litter, but can occasionally be found in old field habitats.

There are six common species of bats that roost in trees year-round and are likely to be winter residents of

AFETA. These species include the evening bat (*Nycticeius humeralis humeralis*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), hoary bat (*Lasiurus cinereus cinereus*), red bat (*Lasiurus borealis*), and silver haired bat (*Lasionycteris noctivagans*). Most other bats of Virginia use caves during the winter but may occur at AFETA during the summer.

Birds

The most common upland game birds include eastern wild turkey (*Meleagris gallopavo silvestris*) and bobwhite (*Colinus virginianus*). Mourning dove (*Zenaida macroura*) are the most common migratory game bird species on the installation. The abundance of mature hardwood forest at AFETA provides excellent habitat with many openings for nesting and foraging important to game bird populations.

Wading birds such as great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), and blackcrowned night heron (*Nycticorax nycticorax*) are expected to be common at AFETA. Two heron rookeries have been observed on the installation: one on the northern part of the base along Skimino Creek and one on the southern part of the base along Queens Creek.

Common raptors at AFETA include turkey vulture (*Cathartes aura*), osprey (*Pandion haliaetus*), redtailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*). Typical owls of the area are common barn owl (*Tyto alba*), eastern screech-owl *(Otus asio*), great horned owl (*Bubo virginianus*), and barred owl (*Strix varia*).

Waterfowl are found along the eastern shore of AFETA along the York River. Mallards (*Anas platyrhynchos*), black ducks (*A. rubripes*), and wood ducks (*Aix sponsa*) are the most abundant species. Other common waterfowl include the Canada goose (*Branta canadensis*), northern pintail (*A. acuta*), northern shoveler (*A. clypeata*), gadwall (*A. strepera*), American wigeon (*A. americana*), ring-necked duck (*Aythya collaris*), and ruddy duck (*Oxyura jamaicensis*). Shorebirds include laughing gull (*Larus atricilla*), herring gull (*L. argentatus*), and common tern (*Sterna hirundo*). Killdeer (*Charadrius vociferus*), willet (*Catoptrophorus semipalmatus*), long-billed dowitcher (*Limnodromus scolopaceus*), and common snipe (*Gallinago gallinago*) are among the sandpiper-like species found at AFETA.

Common woodpeckers include red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*P. villosus*), northern flicker (*Colaptes auratus*), and pileated woodpecker (*Dryocopus pileatus*). Nightjar birds include common nighthawks (*Chordeiles gundlachii*) and whip-poor-wills (*Caprimulgus vociferus*).

Passeriformes (songbirds) observed at AFETA are numerous. Of note was the relative infrequency of brown-headed cowbird observations. These birds are nest parasitizes that are considered to be a threat to the survival of several species of songbirds. The low numbers of cowbirds may be due to the largely unfragmented nature of the installation landscape. Common non-native birds include English house sparrows (*Passer domesticus*), European rock dove (*Columba livia*), and European starlings (*Sternus vulgaris*).

Reptiles

Turtles are represented by the eastern box turtle (*Terrapene carolina*), spotted turtle (*Clemmys guttata*), eastern painted turtle (*Chrysemys picta picta*), red-bellied turtle (*Pseudemys rubriventris*), stinkpot turtle (*Sternotherus*

oderatus), and snapping turtle (*Chelydra serpentina*). The five-lined skink (*Plestiodon fasiatus*) and the southeastern five-lined skink (*E. inexpectatus*) are likely to be the most common lizards at AFETA.

A few of the nonpoisonous snakes from the area include black racer (*Coluber constrictor*), rat snake (*Elaphe obsoleta*), eastern king snake (*Lampropeltis getulus*), brown water snake (*Nerodia taxispilota*), and eastern garter snake (*Thamnophis sirtalis*). The venomous snakes found in the area are copperheads (*Agkistrodon contortrix*), cottonmouth (*A. piscivorus*) and canebrake rattlesnake (*Crotalus horridus atricaudatus*).

Amphibians

Amphibians found in the vicinity of AFETA include various species of salamanders (both aquatic and terrestrial), frogs, and toads. The aquatic salamanders include the greater siren (*S. lacertina*), and the two-toed amphiuma (*Amphiuma means*). Terrestrial salamanders include the eastern newt (i), marbled salamander (*Ambystoma opacum*), two-lined salamander (*Eurycea bislineata*), slimy salamander (*Plethodon chlorobryonis*), and three-lined salamander (*Eurycea guttolineata*).

Toad species include the eastern American (*Anaxyrus americanus americanus*), eastern narrow-mouthed toad (*Gastrophryne carolinensis*) and Fowler's toad (*Anaxyrus fowleri*). Frog species include southern chorus frog (*Pseudacris nigrita*), gray treefrogs (*Hyla chrysoscelis and H. versicolor*), green treefrog (*H. cinerea*), Bringley's chorus frog (*Pseudacris brimleyi*), bullfrog (*Lithobates catesbeianus*), northern green frog (*Lithobates clamitans melanota*), pickerel frog (*R. palustris*), and southern leopard frog (*R. sphenocephala*).

Fish

Within the vicinity of AFETA, the York River is classified as shellfish waters, and the installation's major tidal creeks are important nursery areas for many marine and estuarine fish species. Common estuarine species include spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulatus*), summer flounder (*Paralichthys dentatus*), bluefish (*Pomatomus saltatrix*), weakfish (*Cynoscion regalis*), and striped bass (*Morone saxatilis*). Other species occurring in the York River, but less commonly sought or captured, are the scup (*Stenotomus chrysops*), pigfish (*Orthopristis chrysoptera*), black sea bass (*Centropristes striata*), northern pufferfish (*Tetraodon maculatus*), gray triggerfish (*Balistes capriscus*), tautog (*Tautoga onitis*), silver perch (*Bairdiella chrysoura*), white perch (*Morone americana*), speckled sea trout (*Cynoscion nebulosus*), Spanish mackerel (*Scomberomorus maculatus*), and several kingfish species (*Menticirrhus spp.*).

Freshwater fish habitat at the installation is provided by the several man-made lakes and ponds and by streams. No surveys of the streams have been conducted. The lakes and ponds support species of fish typical of managed recreational fisheries. Included are largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), pumpkinseed sunfish (*Lepomis gibbosus*), black crappies (*Pomoxis nigromaculatus*), redear sunfish (*Lepomis microlophus*), and American eel (*Anguilla rostrata*), mudminnow (*Umbra limi*), and bluespotted sunfish (*Enneacanthus gloriosus*).

A number of anadromous species utilize the York River and its tributaries as spawning and nursery grounds. Important anadromous and semi-anadromous species in this group include striped bass (*Morone saxatilis*), white perch (*Morone americana*), American shad (*Alosa sapidissima*), alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*). The York River and its tributaries also host many important resident and migratory fin fish and shellfish species including Atlantic croaker (*Micropogonias undulatus*). For proposed projects that could

potentially impact the York River, Carter Creek, Skimino Creek, or Queens Creek, coordination with the VDGIF should be undertaken to evaluate potential project impacts on these identified anadromous and semi-anadromous species. In addition, VDGIF suggests minimizing adverse habitat impacts to anadromous and semi-anadromous fish use areas during the critical spawning period by conducting surveys during this time period.

AFETA Wildlife Management Handbook

AFETA updated the AFETA Wildlife Management Handbook in 2016/2017 and the following is a summary of program changes for the upcoming hunting seasons:

- Section "General Hunting Requirements" will be revised: removing the age restriction of 22 years of age and will read: Be a spouse or dependent child who resides in and is a dependent of a current Base staff or contract employee.
- Add to the Wildlife Handbook as paragraph s. under the "General Hunting Requirements" section as follows:
    - Game cameras and or trail photo/video devices are expressly prohibited on AFETA due to training and security regulations.
- Addition of penalties for harvesting fawns under 50 pounds will be added as follows: The second fawn harvested under 50 pounds will result in a suspension of deer hunting privileges for six hunting days. The third fawn harvested under 50 pounds will result in a suspension of hunting privileges for 6 calendar weeks. If there are less than six weeks remaining in the hunting season at the time of the infraction the suspension will continue into the following deer hunting season until the full time is experienced.
- After two seasons of trial it was determined that the "Earn a Buck" program would be discontinued.
- Drawing for the September Goose season will occur at 0500 instead of 0530 to allow more time to get set up for the morning hunt.

All changes or alterations to the AFETA hunting regulations will be implemented during the 2017 hunting season.

2.5.5 Protected Species

Protected species on the installation include migratory birds, anadromous fish, and Federal and state threatened and endangered species. Numerous migratory birds protected under the Migratory Bird Treaty Act of 1918 (16 U.S.C. §703 *et seq*.), as amended, are known to occur on the installation or in the region, including raptors, waterfowl, shorebirds, and songbirds. The following Federal and/or state threatened and endangered species are known or have the potential to occur on the installation:

- **Bald Eagle** *(Haliaeetus leucocephalus*) – The bald eagle is protected under The Bald and Golden Eagle Protection Act (16 U.S.C. § 668) of 1940 and the Migratory Bird Treaty Act (MBTA), as amended. Based on available 2016 survey data from the Center for Conservation Biology, there are currently five active eagle nests located on the installation.

The VDGIF management has made recommendations for avoiding bald eagle disturbance as a result of new or intermittent activities proposed in the vicinity of bald eagle nests. Areas of protection are defined as:

- **Primary Management Zone** – This is defined as the area 750 feet (229 meters) in radius around an occupied nest. The precise size of this zone should depend on site conditions and the individual eagles' tolerance for human activity. The following activities within this zone should not occur at any time:
    - land clearing, clear cutting, mining, and other habitat modification activities;

- development of residential, recreational, agricultural, commercial, or industrial structures, power lines, roads, trails, or any other construction activity;
- use of chemicals toxic to wildlife, such as pesticides and herbicides.

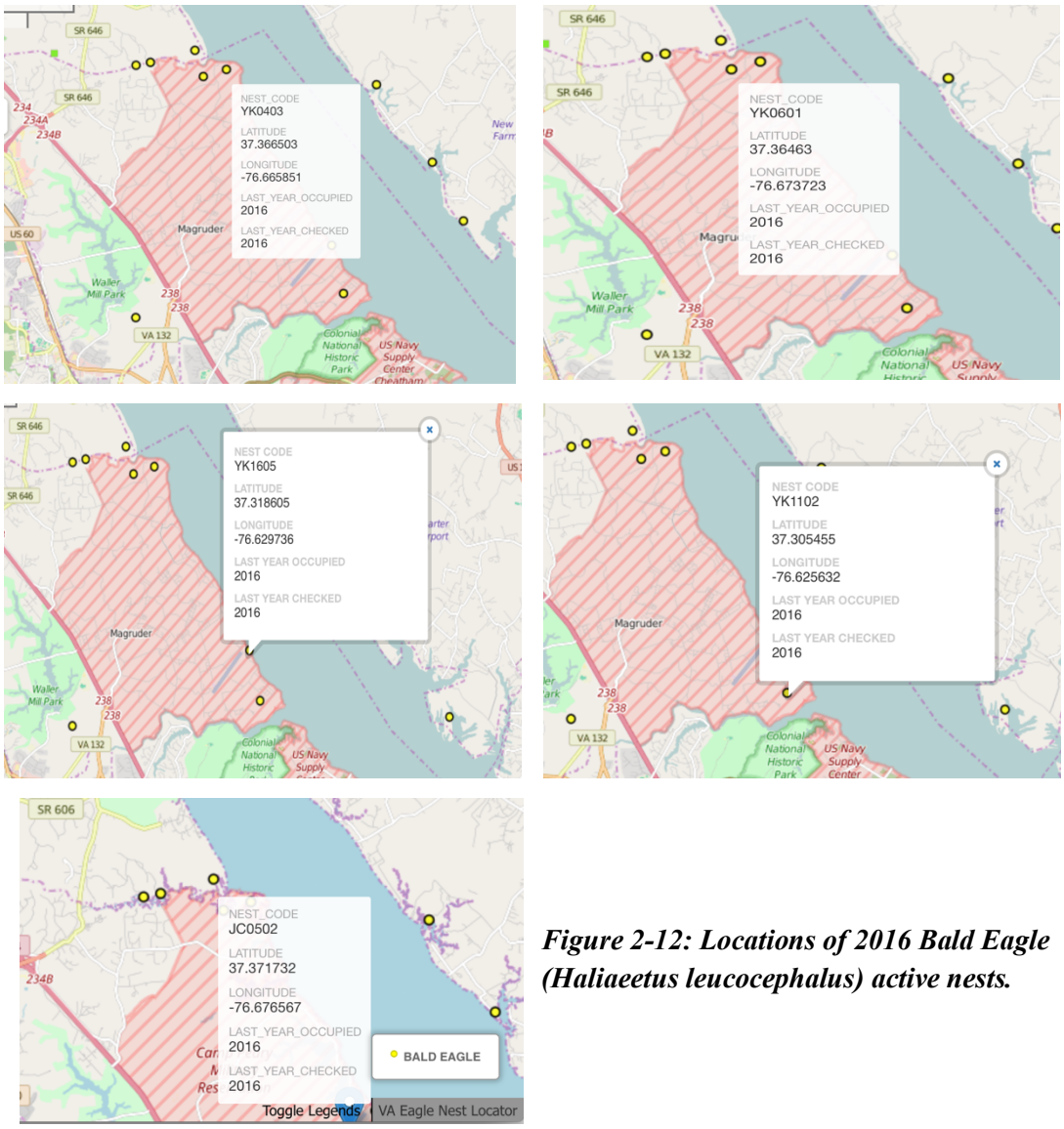


Figure 2-12: Locations of 2016 Bald Eagle (Haliaeetus leucocephalus) active nests.

The following activities should not occur during the breeding/nesting season (December 15 - July 15), unless the nest is determined to be unoccupied in a particular year (VDGIF usually has this information after March 31):

- maintenance of existing buildings and roads;
- use of motorized vehicles and heavy equipment;
- aircraft flyovers within 1000 vertical feet of the ground;
- human entry and activities, including recreation, such as hiking, camping, picnicking, hunting, fishing, boating, jet skiing, etc.;
- loud noise generating activities, including blasting.

- Limited selective timber harvest to within 300 feet (91 meters) of the nest tree, after consultation with the VDGIF/USFWS biologists, may be possible *outside* the breeding/nesting season, if a forest canopy is maintained.

- **Secondary Management Zone** – This is defined as the area from 750 feet (229 meters) to 1,320 feet (400 meters) in radius around an occupied nest. The precise size of this zone should depend on site conditions and the individual eagles' tolerance for human activity. Restrictions in this zone are necessary to minimize disturbance that could compromise eagle use of the nest. Most activities within this zone should be restricted during the breeding/nesting season, and allowable activities should be determined by VDGIF/USFWS on a case-by-case basis. Development and vegetation clearing should be minimized and line-of-sight vegetation buffers to the nest should be maintained. The following activities within this zone should generally not occur at any time:
  - development of multi-story buildings; high density housing (construction of single 4 story, low density residential houses may be acceptable); large commercial, industrial, or agricultural facilities; high traffic roads; and facilities that would generate loud noise;
  - use of chemicals toxic to wildlife, such as pesticides and herbicides.

  The following activities should not occur during the breeding/nesting season (December 15 - July 15), unless the nest is determined to be unoccupied in a particular year (VDGIF usually has this information after March 31):
  - aircraft flyovers within 1000 vertical feet of the ground;
  - construction activities;
  - recreational activities that generate loud noise, such as motorized boats, jet skis, etc.;
  - other loud noise generating activities, including blasting.

  Outside of the breeding/nesting season, most other activities can be conducted within the secondary management zone as determined on a case-by-case basis by VDGIF/USFWS.

- **Atlantic Sturgeon** (*Acipenser oxyrinchus oxyrinchus*) – The Atlantic sturgeon is a Federal endangered species with a known distinct spawning population occurring within the Chesapeake Bay. The DGIF has confirmed the York River as an Anadromous Fish Use Area, and as such may contain Atlantic sturgeon. The Atlantic sturgeon is managed under a Fishery Management Plan implemented by the Atlantic States Marine Fisheries Commission (ASMFC). In 1998, the ASFMC instituted a coast-wide moratorium on the harvest of Atlantic sturgeon, which is to remain in effect until there are at least 20 protected age classes in each spawning stock (anticipated to take up to 40 or more years). National Marine Fisheries Service (NMFS) followed the ASMFC moratorium with a similar moratorium for Federal waters. The ASMFC's Atlantic sturgeon Fishery Management Plan also includes measures for preservation of existing habitat, habitat restoration and improvement, monitoring of bycatch and stock recovery, and breeding/stocking protocols. Atlantic sturgeon is an anadromous species in which adult's spawn in freshwater in the spring and early summer and migrate into estuarine and marine waters where they spend most of their lives. In some southern rivers, a fall spawning migration may also occur. They spawn in moderately flowing water (46-76 cm/s) in deep parts of large rivers. Sturgeon eggs are highly adhesive and are deposited on bottom substrate, usually on hard surfaces (e.g., cobble). It is likely that cold, clean water is important for proper larval development. Once larvae begin migrating downstream, they use benthic structure (especially

gravel matrices) as refuges. Juveniles usually reside in estuarine waters for months to years. Sub-adults and adults live in coastal waters and estuaries when not spawning, generally in shallow (10-50 m depth) nearshore areas dominated by gravel and sand substrates. Long distance migrations away from spawning rivers are common.

- Threats to the already depressed populations of Atlantic sturgeon include habitat degradation, vessel strikes, and being accidentally caught and potentially injured or killed by fishermen. Dredging can displace sturgeon while it is occurring and affect the quality of the habitat by changing the depth, sediment characteristics, and prey availability. Water quality has also been degraded in areas throughout the range of the Chesapeake Bay as a result of industrial run-off and the damming of some rivers.

  In order to define habitat, use, and migration patterns of Atlantic sturgeon within the Chesapeake Bay and near installations, in 2016, the Navy has funded a tracking study, with a focus on Atlantic sturgeon. Within the 75-receiver array, 653 Atlantic sturgeon have been detected, which were originally tagged in various states from Connecticut to Georgia (Hager 2015). Atlantic sturgeon was detected year-round, but the number of fish near Naval Station Norfolk peaked in the fall (September-November) in both years (Hager 2015). While it appeared that juvenile Atlantic sturgeon were foraging in the area, adults passed through without spending extended periods of time. Both adults and sub-adults are capable of long-distance movements. Adults move up rivers in the spring (April to May in the Mid-Atlantic) to spawn, and males may remain in the river or estuary until the fall, whereas females usually leave the river within four to six weeks.

  The Navy has determined management practices for the Atlantic sturgeon to include:
  - the reduction or minimization of the amount of dredging,
  - implementation of the management measures for the protection of water quality, improvement of nearshore habitat, and reduction of run-off,
  - implementation of additional sediment control for monitoring of non-point source pollution,
  - implementation of additional wetland protection,
  - protection of watersheds from hazardous materials, and
  - the use of environmentally beneficial landscaping and restoration of coastal habitat through the planting of submerged aquatic vegetation, the restoration of oyster reefs, and establishment of living shorelines.

  These management actions and projects provide additional benefits to the loggerhead sea turtle (and other protected sea turtles) that may use the lower rivers of the Chesapeake Bay for foraging habitat.

- **Sensitive Joint-Vetch** (*Aeschynomene virginica*) – The sensitive joint-vetch, a Federal listed threatened plant species, is known to occur in James City County. However, individuals have not been identified, as suitable habitat is generally not available on the installation. No surveys have been completed on this species.

- **Small Whorled Pogonia** *(Isotria medeoloides*) – The small whorled pogonia, a Federal listed threatened plant species, is known to occur in both James City and York Counties. Although suitable habitat does occur, no known populations of this species have been identified on the installation. Surveys were completed in August 2017 in the northern most area of the installation known as Area 1 and identified 9

areas of potential habitat. Potential habitat areas are distributed throughout the study area and have favorable habitat attributes that are consistent with those noted in the USFWS Recovery Plan and associated literature.

- **Black Rail, Henslow's Sparrow, and Mabee's Salamander** – The black rail (*Laterallus jamaicensis*) is a state listed endangered species, while Henslow's sparrow (*Ammodramus henslowii*) and Mabee's salamander (*Ambystoma mabeei*) are state listed threatened species. These species are either known or likely to occur in areas surrounding the installation, and as such appropriate habitat for these species is predicted to occur on the installation. No individuals of these species have been documented on AFETA to date. No surveys have been completed on this species.

- **Northern Long-Eared Bat (*Myotis septentrionalis*)** - In 2015, the USFWS made a species-specific rule under authority of section 4(d) of the Endangered Species Act of 1973, as amended (Act), that provides measures that are necessary and advisable to provide for the conservation of the northern long-eared bat (*Myotis septentrionalis*) and determined this species warrants listing as a threatened species under the Act.

  The northern long-eared bat (*Myotis septentrionalis*) is federally listed as a threatened species under the Endangered Species Act. Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. This bat has also been found rarely roosting in structures, like barns and sheds. No individuals of these species have been documented on AFETA to date. No surveys have been completed on this species; however, since is a Federal facility, it must comply with the USFWS time of year restriction from 01 June to 31 July for northern long-eared bats outside of hibernacula. USFWS have established separate prohibitions from take for activities involving tree removal and activities that do not involve tree removal. Incidental take of northern long-eared bats outside of hibernacula resulting from activities other than tree removal is not prohibited. Incidental take resulting from tree removal is prohibited if it:

  1) occurs within a 0.25-mile (0.4 kilometer) radius of known northern long-eared bat hibernacula; or
  2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-meter) radius from the known maternity tree during the pup season (June 1 through July 31). Incidental take of northern long-eared bats as a result of the removal of hazardous trees for the protection of human life and property is not prohibited.

- **2016 Virginia Endangered State listing of the tri-colored bat *(Perimyotis subflavus)* and little brown bat *(Myotis lucifugus)***
  The tri-colored bat (formerly known as the eastern pipistrelle) was, historically, one of the most common species of bats found throughout the eastern forests of America – from Nova Scotia and Quebec, south

throughout the east coast of Mexico into northern Central America. But, surprisingly little is known about its daytime summer or maternity roosts. These bats are among the first bats to emerge at dusk each night, and their appearance at tree-top level indicates that they may roost in foliage or in high tree cavities and crevices. No surveys for either of the bat species have been conducted on AFETA during the 2016 survey period; however, no known hibernacula have been identified on the installation by State agencies. AFETA will evaluate all projects to ensure that all best management practices for the conservation of little brown bats and tri-colored bats are adhered to protect available habitat.

3.0 NATURAL RESOURCE MANAGEMENT ISSUES

3.1 PRIMARY MANAGEMENT ISSUES

Ecosystem management is an interdisciplinary planning and management process that focuses on identifying, restoring, and maintaining natural communities in support of the military mission and other sustainable activities. Natural resources management in many areas of the installation is somewhat restricted by mission constraints, with much of the area serving as building and operations, and explosive ordnance training areas in which access is frequently limited.

The primary management issues are listed below for the installation:

- Wetland and Water Quality Protection;
- Coastal Resource Management;
- Bird/Animal Aircraft Strike Hazard (BASH) Reduction;
- Invasive Species and Pest Management;
- Forestry Management;
- Fish and Wildlife Management;
- Protected Species;
- Grounds Maintenance; and
- Environmental Restoration Program and Other Restricted Areas.

In addition, under NEPA, Federal agencies are required to consider and disclose the potential effects of their actions and decisions on the environment. In many cases, Federal actions have the potential to contribute to climate change by producing greenhouse gas emissions or alternatively, be affected by many of the impacts of a changing climate, such as rising sea levels, extreme weather, drought and wildfires. Federal agencies must provide a level of predictability and certainty to describe these impacts by quantifying greenhouse gas emissions when conducting NEPA reviews. This increased predictability and certainty will allow AFETA to more fully understand the potential climate impacts of all proposed Federal actions, and in turn, assist in comparing alternatives and considering measures to mitigate the impacts of climate change.

3.2 WETLAND AND WATER QUALITY

AFETA contains approximately 1,000 acres of wetlands and open water habitat within the installation boundary. These waters and wetlands produce many ecological benefits to the landscape while sedimentation produced by construction and stream channel erosion is the largest threat to water quality on the installation. AFETA does not currently have widespread problems with upland soil erosion in wooded areas. Soil erosion mainly occurs from disturbed soil on construction sites. The threats from these sources are minimized on the installation through the application of guidelines outlined in the AFETA Storm Water Management Master Plan and all requirements and regulations as stated in the Virginia Stormwater Management Program (VSMP) as regulated by the VDEQ.

AFETA incorporates the following preventative measures as outlined in the Virginia Department of Forestry BMPs to minimize the risk of erosion:

- Locating logging skid trails and loading decks in areas that will avoid erosion problems;
- Properly maintaining roads;
- Ensuring application of Virginia Erosion and Sediment Control Law in engineering project design;

- Monitoring erosion control during construction projects; and
- Detecting potential erosion problems when making aerial flights for forest disease or insect detection.

3.2.1 Invasive Species Control in Wetlands

A more localized threat to wetlands areas are invasion by non-native plants (i.e. common reed (*Phragmites australis*)) and animal species (i.e. nutria (*Myocastor coypus*)). Preservation of valuable wetland resources require attention to erosion problem areas and the control of invasive species infestations to limit the spread and damage done to the natural landscape. Common reed is a tall perennial wetland grass that can grow as tall as 13 feet. Vertical stalks arise from rhizomes and stallions (tough horizontal shoots) that are found at or below ground level. The tendency of this species to form dense monospecific stands often results in displacement of native species that offer more beneficial values to wildlife (i.e., food and shelter) than does common reed. The eradication of common reed has been achieved through a combination of herbicide applications and prescribed burning. Herbicides used to control common reed must be labeled for wetland use. Rodeo®, a glyphosate herbicide manufactured by the Monsanto Company, is such a chemical. The best time for application is in the early autumn (September to early October). A hand-pumped, low pressure, backpack sprayer should be used. The suggested application is 1.5 percent solution of Rodeo® and a 0.5 percent solution of surfactant TL-90® manufactured by Timberline Incorporated. Mechanical harvesting or burning the herbicide-killed common reed should follow in late fall or winter to remove above-ground biomass. Removal of this debris increases the effectiveness of future herbicide treatment and opens space for growth of desirable plants. Spot treatments following these same steps should be repeated during the following year to eliminate remaining plants that were not destroyed during the first year. Minimizing soil disturbance is important in avoiding re-colonization by common reed (Clark 1997).

An additional herbicide named Habitat (or AI Imazapyr) is labeled for controlling undesirable emergent, shoreline and woody wetland aquatic vegetation in and around standing and flowing water. Habitat is a systemic herbicide that delivers down-to-the-roots aquatic and riparian weed control, enabling users to cost effectively reclaim and maintain waterways and wetlands that have lost value to emergent invasive species. Habitat herbicide controls vegetation by affecting enzymes found only in plants, not in humans, animals, birds, fish or insects. It is readily absorbed through leaves, stems and roots and is translocated rapidly throughout plants, with accumulation in the meristematic regions. Treated plants stop growing soon after spray application. Necrosis becomes evident about two weeks after treatment. Time to death of treated weeds depends on size, species treated and weather conditions at application. Habitat is applied with low volume spray techniques, which result in more effective and efficacious control and often reduce the need for multiple applications.

3.2.2 Wetland Regulatory Compliance

The wetland and water quality protection program supports the training mission by working with commands on environmental review and compliance with federal and state wetland regulation and policies in support of AFETA training, construction, and range development proposals.

In 2017, AFETA continues to comply with all Federal, State, and Local environmental requirements to ensure no net loss of wetlands on the installation including:

- *The Clean Water Act* – All regulated activities are evaluated as part of the regulatory permit process.
- *Executive Order 11990, Protection of Wetlands* – All regulated activities are evaluated as part of the regulatory permit process

- *Chesapeake Bay Preservation Act* – All regulated activities are evaluated as part of the regulatory permit process.
- *Executive Order 13508, Chesapeake Bay Protection and Restoration* -– All regulated activities are evaluated as part of the regulatory permit process.
- *Wetland Best Management Practices* - Before any project takes place, due diligence is taken during the planning and design stages to determine if the project is located within state waters or Waters of the US (WOUS), or within associated CBPAs, and make all reasonable efforts to include best management practices.
- *Stormwater Regulatory Compliance and Management* - Construction projects on the installation are required to follow all requirements and regulations as stated in Federal, State, and Local stormwater regulations.
- *Floodplain Management* – AFETA strives to avoid to the extent possible the long-term and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

3.2.3 Wetland Best Management Practices

Section 404 of the CWA exempts normal forestry operations including harvesting as long as state BMPs are implemented from the permitting process. Conversion of bottomland hardwoods to pine plantations and mechanical site preparation in most situations, however, do require a permit. General recommendations for timber harvesting in wetlands or on wet soils include the following:

- Road designs in wetlands should provide cross drainage of the wetland during both flooded and low water conditions.
- Road construction should be avoided during wet periods.
- Outflow from road drainage ditches should be diverted prior to entering wetlands and riparian areas.
- The width of the road surface should be kept to the minimum necessary (typically 12 feet wide for straight sections and 16 feet for curves).
- Road use should cease if ruts exceed six inches in depth for more than 300 feet.
- Any backfill around culverts in wetlands should be constructed of free drainage granular material.
- All culverts in organic soils should be 24 inches in diameter and placed with their bottom half in the upper 12 inches of the soil to handle the subsurface flow and their top half above the surface to handle aboveground flow.
- Low ground pressure equipment (flotation tires) should be used whenever possible to prevent rutting.
- The number and size of landings should be kept to the minimum necessary and, where possible, should be located outside wetlands and far from streams on well-drained areas with gentle grades.
- Harvests should be scheduled during the drier seasons of the year.
- The crossing of perennial or intermittent streams and waterways should be minimized.
- Portable bridges, pole fords, and corduroy approaches should be used to prevent channel and bank disturbances.
- Streams should be crossed at right angles.

3.3 COASTAL RESOURCES MANAGEMENT

In 2017, AFETA continues to comply with all Federal, State, and Local environmental requirements including:

- *Coastal Zone Management Act*- AFETA ensures that any proposed actions are consistent with each of the enforceable policies under Virginia's Coastal Zone Management Program.

- *Shoreline Erosion and Management and Best Management Practices* – AFETA ensures that all proper erosion and structural management strategies have been developed for the areas of shoreline erosion identified on the installation. The purpose of the Shoreline Management Plan is to provide guidelines for the management of AFETA tidal shoreline in accordance with state and federal regulations, regional initiatives, and Department of Defense policies on environmental stewardship and ecosystem management. Refer to Section 2.4.6 for details regarding all shoreline management reports and findings.

3.4 BIRD/ANIMAL AIRCRAFT STRIKE HAZARD REDUCTION

The DON OPNAVINST 5090.1B specifically Chapter 22 outlines the responsibilities of the natural resource manager to prepare and implement Bird Aircraft Strike Hazard (BASH) Reduction plans for the installation with a flying mission as an integral part of the Integrated Natural Resources Management Plan. The NAVFAC P-73 Manual provides guidance for the natural resource manager in developing a BASH program. In addition, all BASH Programs should be in accordance with OPNAVINST 3750.6S, OPNAVINST 8020.1, and the DOD Manual 4150.07-V3, DOD Pest Management Training and Certification Program Manual, 23 May 2013.

Within the operational area of AFETA, bird aircraft strike hazards exist due to its geographic location and proximity to major water courses and coastal marine waters. Daily and seasonal bird movements create varying degrees of hazardous conditions. AFETA's BASH program has been designed to identify and communicate hazardous conditions; establish operating procedures to avoid high hazard situations; and establish guidelines to eliminate, control, or reduce environmental factors that attract birds to the airfield.

Installation have a number of wildlife management and control techniques available for use based on mission and airfield control requirements:

- Active controls – USDA Wildlife Services Biologists; Wildlife detection and dispersal teams; Depredation (firearms); Pyrotechnics; Air rifles; Bio-acoustics; Propane gas cannons; Falconry; Dogs; Radio-controlled units; All-terrain vehicles; and/or Effigies

- Passive Controls – Grass management; Forest management; Herbicide and pesticide applications; Landscaping; Removal of edge effect; Airfield wetland and water management; Stormwater management; Wastewater treatment facility management; soil cementing; Sanitary landfill management; agricultural outlease management; and/or Fencing

Currently there is approximately 250 acres of clear zone (maintained grass lawn and runway) surrounding the airfield in order to minimize obstructions to flight approaches, runways, and air tower site clearances. The following procedures have been implemented to minimize the risk of a wildlife strike:

On the airfield

1. Removal of perches from the airfield. Derelict equipment, unnecessary gear, and everything that could be perched on has been removed from flight areas.
2. Anything that couldn't be removed is covered with spikes, wire octopuses, and other perch deterring devices.
3. Trees and shrubs used by wildlife to perch on or hide in have been removed along the airfield.
4. Operation of a Bird Deterrent Dispersal Team, or BASH team, which responds to wildlife problem situations on the airfield.

5. Airfield operators drive the airfield pre-flight approaches and post-aircraft takeoff to ensure that there is no wildlife on the airfield. In addition, air tower operators maintain visual contact with the aircraft during approach landings and take-off.

In the area surrounding the airfield

1. Hangars are a prime place for birds to perch and nest. A goal of the BASH program is to deter nesting birds from flight line facilities.
2. A BASH orientation is part of the installation airfield brief. BASH is promoted at every level as everyone's responsibility; it's not just the pilots' or the facilities crews' responsibility.
3. BASH program updates are updated and presented at the base meetings. Additionally, current wildlife trends are discussed, past wildlife trends reviewed, and BASH warnings issued based on those trends.
4. The BASH instruction outlines the standard-operating procedure for the use of pyrotechnics, live ammo, and other random deterrent devices.
5. Airfield operators keep detailed strike or near strike records. The BASH team uses these records to determine what species are recurring problems and take steps to remove or eliminate them.

To date, there have not been any documented air strikes with wildlife on the AFETA airfield. Should a wildlife strike occur with an aircraft, the incident would be reported to both the Environmental Manager and the Natural Resources Manager and properly documented.

In 2017, AFETA continues to comply with all Federal, State, and Local environmental requirements including:

- *Bird/Animal Aircraft Strike Hazard Reduction Best Management Practices* – AFETA continues to manage approximately 250 acres of clear zone (maintained grass lawn and runway) surrounding the airfield in order to minimize obstructions to flight approaches, runways, and air tower site clearances.

- *Best Management Practices for Invasive Species Control & Pest Management* - AFETA continues to provide invasive species control and pest management through an integrated pest management program.

- *Best Management Practices for Nuisance Wildlife Damage* – Although nuisance species populations on the installation have not yet exceeded manageable populations, wildlife damage control and management practices are in place on the installation.

3.5 INVASIVE SPECIES MANAGEMENT

On February 3, 1999, E.O. 13112, Invasive Species, was signed establishing the National Invasive Species Council. This E.O. and other pertinent statutes provide a framework for agencies to prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause. To the extent practicable and permitted by law, the installation will use the following processes as part of their grounds maintenance and invasive species control programs:

- Prevent the introduction of invasive species;
- Detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner;
- Monitor invasive species populations accurately and reliably;
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded;
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and

- Promote public education on invasive species and the means to address them.

Invasive species control and pest management at AFETA is achieved through an integrated pest management program, rather than traditional pest management. In accordance with DODINST 4150.07, AFETA has developed an Integrated Pest Management Plan (IPMP) (2015). The IPMP is a comprehensive, long-range document that captures all the pest management operations and pesticide-related activities conducted on the installation. It incorporates pest management practices, and the local, state, Federal, and DOD regulations conforming to the requirements of DODINST 4150.07 and OPNAVINST 6250.4C, while providing comprehensive information to installation staff and internal and external compliance auditors. All installation personnel and organizations will review the IPMP and ensure full compliance. No in-house or contract pest control operations, including pesticide (e.g., herbicide, insecticide, rodenticide, etc.) applications, may be conducted on the installation without prior coordination and approval.

Environmental and Public Works are the offices of primary responsibility for implementation of the IPMP. General pest control services on the installation are provided by contract with Dodson Pest Control. Guest Services Inc. is the grounds maintenance contractor on AFETA. The installation may occasionally hire contractors for invasive species/weed control, but currently there are no projects requiring the use of pesticides. Through implementation and cooperation, a safe, healthy, and clean environment for current and future generations can be ensured. The objectives of the IPMP are listed below.

1. The prevention of pest-related health and safety problems that affect the mission. Prevention of pest-borne disease and injury is a component of Force Health Protection. Force Health Protection seeks to maintain a healthy and fit military and civilian force in order to maintain the highest levels of readiness. Pest management is a "Force Multiplier" for construction battalions, aircraft squadrons, and other deployable units. Additionally, the military and civilian infrastructure on the installation must be protected in order to provide the necessary support to these units as well. Readiness also means ensuring that all installation personnel, including dependents, are provided with healthy work and living conditions that will contribute to a high quality of life.
2. The prevention of pest damage to equipment and subsistence used to support the operational mission of the activities and tenant commands. Equipment and materials are susceptible to physical damage by pests. Rodents, for example, can cause considerable damage to an aircraft's electronic equipment through gnawing on electrical components.
3. Vegetation management to protect the local environment. The introduction of non-native species of plants can increase the risk of fire and degrade the surrounding native environment that is home to a number of endangered and threatened animal and plant species.
4. The protection of government real property, materiel and aesthetics. Buildings and roads that form the infrastructure of the installation are susceptible to pests. Termites can cause extensive damage to wood structures if not adequately prevented and controlled. Weeds can cause damage to roadways and increase the risk of fire.
5. The reduction of the use and dependence on pesticides.

Current pest management operations on the installation can be broken into seven categories: General Household and Nuisance Pests; Grounds Maintenance; Aquatic Weed Control; Structural Pests; Stored Products Pests; Health Related Pests; and Pest Management in Quarters and Housing. Each category is further detailed and elaborated upon in the IPMP. The following is a list of pest management priorities for AFETA.

- Prevention of pest interference with mission operations due to:
    - Birds infesting training sites; and
    - Unwanted vegetation growing in training ranges, and on the airfield runway, aprons, and taxiways.
- Prevention of pest related health problems resulting from:
    - Mosquitoes and ticks;
    - Food contamination by cockroaches, mice, and stored product pests; and
    - Area contamination from fecal droppings from birds and other wildlife.
- Prevention of pest interference with installation operations by preventing:
    - Vegetation that impairs fence line visibility, creates a fire hazard, or destroys/damages paved surfaces;
    - Vegetation encroachment to electrical substations and transformer vaults;
    - Rodent destruction by gnawing on electrical and communication wires and cables; and
    - Interference with personnel movement because of stinging arthropods.
- Protection of government real property (wood) from termites, wood decay, and wood destroying beetles.
    - Maintenance of morale of students, employees, installation residents, and their dependents by controlling pest arthropod and vertebrate infestations in office spaces, work areas, housing units, and recreational areas.
- Preservation of the natural aesthetics of the installation by controlling arthropod, fungal, viral, and vertebrate pests that negatively affect urban and forest resources, ornamental plantings, turf, and natural resources.

3.5.1 Best Management Practices for Invasive Species Control & Pest Management

- IPMPs should be reviewed annually and updated as necessary.
- All persons performing pest management activities should be certified and trained in integrated pest management.
- Only use registered pesticides, which have been approved by the EPA and the state.
- Determine if a non-chemical method could achieve the same result as a chemical method, but be more effective, less costly or less time-consuming.
- Choose pesticides with the lowest toxicity to humans and the least environmental impact.
- Choose pesticides that provide a long-term or sustainable solution.
- Maintain accurate and up to date pest management records, including applications for each building, structure, or outdoor site.

3.5.2 Best Management Practices for Nuisance Wildlife Damage

Several nuisance wildlife species occur on the installation, including beavers (*Castor canadensis*), ground hogs (Marmota *monax*), and nutria (*Myocastor coypus*). Wildlife damage control and management actions are divided into three primary categories: active management, habitat management, and interdepartmental coordination. Although nuisance species populations on the installation have not yet exceeded manageable populations, wildlife damage control and management practices, including the following, are in place on the installation:

- Coordinate and respond to complaints from installation personnel regarding nuisance wildlife pests;
- Maintain accurate records of nuisance wildlife handling for annual reporting;

- Coordinate maintenance and repair of installation buildings (i.e., warehouses and office spaces) that have a history of nuisance wildlife pests;
- Provide information and education for installation residents and workers on wildlife nuisance wildlife, wildlife disease vectors (ticks, small mammals), and situations where wildlife becomes both nuisance and pest;
- Continue active management of observed nuisance wildlife (ground hogs, foxes, and beavers) when interference with operations or structures are noted.
- Continue passive hunting of coyotes to maintain appropriate predator levels and minimize effect on mammal and bird populations.

3.5.3 Invasive Species- Vegetation

A large number of invasive species occur on sites that were previously developed, disturbed by military training, or other land uses throughout much of the forested area on the installation. These species generally became established on old home sites, abandoned training areas and wildlife food plots, and are now spreading throughout large portions of the installation. To the extent practicable and permitted by law, the installation will use the following processes as part of their grounds maintenance and invasive species control programs:

- Prevent the introduction of invasive species;
- Detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner;
- Monitor invasive species populations accurately and reliably;
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded;
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and
- Promote public education on invasive species and the means to address them.

Invasive species control and pest management at AFETA is achieved through an integrated pest management program, rather than traditional pest management. In accordance with DODINST 4150.07, AFETA has developed an Integrated Pest Management Plan (IPMP) (2015). The IPMP is a comprehensive, long-range document that captures all the pest management operations and pesticide-related activities conducted on the installation. It incorporates pest management practices, and the local, state, Federal, and DOD regulations conforming to the requirements of DODINST 4150.07 and OPNAVINST 6250.4C, while providing comprehensive information to installation staff and internal and external compliance auditors. All installation personnel and organizations will review the IPMP and ensure full compliance. No in-house or contract pest control operations, including pesticide (e.g., herbicide, insecticide, rodenticide, etc.) applications, may be conducted on the installation without prior coordination and approval. Environmental and Public Works are the offices of primary responsibility for implementation of the IPMP. General pest control services on the installation are provided by contract with Dodson Pest Control. Guest Services Inc. is the grounds maintenance contractor on AFETA. The installation may occasionally hire contractors for invasive species/weed control, but currently there are no projects requiring the use of pesticides. Through implementation and cooperation, a safe, healthy, and clean environment for current and future generations can be ensured. The objectives of the IPMP are listed below.

1. The prevention of pest-related health and safety problems that affect the mission. Prevention of pest-borne disease and injury is a component of Force Health Protection. Force Health Protection seeks to maintain a healthy and fit military and civilian force in order to maintain the highest levels of readiness. Pest management is a “Force Multiplier” for construction battalions, aircraft squadrons, and other

deployable units. Additionally, the military and civilian infrastructure on the installation must be protected in order to provide the necessary support to these units as well. Readiness also means ensuring that all installation personnel, including dependents, are provided with healthy work and living conditions that will contribute to a high quality of life.

2. The prevention of pest damage to equipment and subsistence used to support the operational mission of the activities and tenant commands. Equipment and materials are susceptible to physical damage by pests. Rodents, for example, can cause considerable damage to an aircraft's electronic equipment through gnawing on electrical components.
3. Vegetation management to protect the local environment. The introduction of non-native species of plants can increase the risk of fire and degrade the surrounding native environment that is home to a number of endangered and threatened animal and plant species.
4. The protection of government real property, materiel and aesthetics. Buildings and roads that form the infrastructure of the installation are susceptible to pests. Termites can cause extensive damage to wood structures if not adequately prevented and controlled. Weeds can cause damage to roadways and increase the risk of fire.
5. The reduction of the use and dependence on pesticides.

AFETA utilizes the following best management practices for invasive species control:

- IPMPs should be reviewed annually and updated as necessary.
- All persons performing pest management activities should be certified and trained in integrated pest management.
- Only use registered pesticides, which have been approved by the EPA and the state.
- Determine if a non-chemical method could achieve the same result as a chemical method, but be more effective, less costly or less time-consuming.
- Choose pesticides with the lowest toxicity to humans and the least environmental impact.
- Choose pesticides that provide a long-term or sustainable solution.
- Maintain accurate and up to date pest management records, including applications for each building, structure, or outdoor site.

3.6 FORESTRY MANAGEMENT

Forest management activities on the installation are conducted through the Forest Management Plan for AFETA (2017) and AFETA complies with all Federal, State, and Local environmental requirements including:

Forestry Management Operations

AFETA ensures that all general silvicultural practices and forestry management operations and procedures are currently in place for Loblolly Pine, Loblolly Pine-Hardwood, and Sweetgum-Yellow Poplar. In 2016, the Natural Resources Department began work on updating the forest management plan and inventory updates for the installation. All results and findings are documented in *AFETA Camp Peary Forest Inventory (FINAL June 2017*.

Prescribed Burning

Prescribed burning is a widely accepted and economically sound tool for use on pine forestlands and agricultural areas. Prescribed burning is a management tool that is beneficial to public safety, forest and wildlife resources, environment, and economy. The following are benefits that result from prescribed burning of forestlands:

- Prescribed burning reduces the naturally occurring buildup of vegetative fuels on forestlands, thereby reducing the risk and severity of wildfires and lessening the loss of life and property.
- The use of prescribed burning in these woodland-urban interface areas substantially reduces the risk of wildfires that cause damage.
- Many natural ecosystems require periodic fire for their survival. Prescribed burning is essential to the perpetuation, restoration, and management of many plant and animal communities. Prescribed burning benefits game, nongame, and endangered wildlife species by increasing the growth and yield of plants that provide forage and an area for escape and brooding and that satisfy other habitat needs.
- Forestlands are economic, biological, and aesthetic resources of statewide significance. In addition to reducing the frequency and severity of wildfires, prescribed burning of forestlands helps to prepare sites for replanting and natural seeding, to control insects and diseases, and to increase productivity.
- Prescribed burning enhances lands that are managed for wildlife refuges, nature preserves, and game lands.

Prescribed burning is often the most practical solution to reducing hazardous fuel accumulations and managing wildlife habitat. The primary applications of prescribed burning include:

- Reducing hazardous fuel accumulation,
- Preparing sites for seeding and planting,
- Controlling undesirable vegetation,
- Improving access and aesthetics,
- Encouraging oak regeneration, and
- Thinning of overstocked natural loblolly pine regeneration.

Wildfire within hardwood areas is often detrimental; however, when oaks are a major component of upland forests, properly conducted prescribed burning may be used as a regeneration tool in concert with shelterwood harvesting. Most bottomland hardwoods are not tolerant of high intensity fire, and if burning is to be conducted in such stands, a dormant season backfire is the suggested method.

Prescribed burning in loblolly pine stands for the purposes of thinning young overstocked stands and for site preparation prior to regeneration in harvested areas are two potential additional uses of controlled fire. Prescribed burning for thinning overstocked stands should be conducted during the winter season using backfire. For regeneration purposes, prescribed burns should be conducted during late summer or early fall. Restoring the natural fire regime of the ecosystems on the base will further contribute to a sustainable and diverse land base. Prescribed fire can be harmful as well as beneficial and should only be conducted by trained and experienced personnel. Proper diagnosis of fire conditions and detailed planning for smoke management are needed each time a burn is conducted. Prescribed burns are occasionally conducted in winter for fuel reduction, under the direction of the installation Natural Resources Manager and Fire Chief. Prescribed fires should be fully coordinated with the local fire department, and the VDEQ, as deemed appropriate by the Fire Chief. The impact on all resources, including air quality, wildlife, protected species and habitats, forest cover type, riparian areas, and aesthetics should be considered to maximize the beneficial effects of prescribed burning. When planning any prescribed burn activities, the procedures, guidelines, and required tools and equipment detailed by the Fire Chief and burn permit authorizations should be strictly followed. Prescribed burn plans and smoke management plans should be carefully developed for each event.

AFETA strives to use prescribed burning to reduce hazardous fuel accumulations, manage wildlife habitat, prepare sites for seeding and planting, control undesirable vegetation, improve access and aesthetics, encourage oak regeneration, and thin overstocked natural loblolly pine regeneration.

Smoke Management

The EPA has issued an Interim Air Quality Policy on wildland and prescribed fires that contain important guidance for conducting prescribed burns. The policy encourages managers to

1. notify air quality agencies of plans to significantly increase the use of fire;
2. take air quality impacts of fire into consideration and take appropriate steps to mitigate the impacts;
3. consider alternatives to fire that will meet land management objectives, and
4. participate in the development of smoke management plans.

EPA does not plan to restrict burning activities, but rather will ask that the adequacy of the smoke management plan be expeditiously reviewed. If a smoke management plan is not developed and burning activities are found to contribute to particulate concentrations above the National Ambient Air Quality Standards for particulate matter of 2.5 microns or smaller, EPA will force development and implementation of a mandatory smoke management plan and may re-designate these areas as nonattainment, which then imposes requirements for emission reductions.

Occasionally weather conditions are within allowable prescription guidelines for prescribed burning but smoke will not dissipate. These conditions often result from thermal inversion in which warm air aloft traps air close to the earth's surface. In this situation, smoke will lie close to the ground and cause poor air quality and visibility. It is possible to "smoke in" a town for several days. In addition, if smoke crosses a road, a serious problem could exist for motor vehicles and could result in liability claims. AFETA ensures that all prescribed burning is conducted in accordance with state and federal guidelines.

Areas Excluded from Active Forest Management

AFETA continues to ensure that the following zones are left as buffers:

- Intact forested area around ranges and other training facilities to provide visual, noise, and security buffers;
- Recreational area zones of 100-150 feet surrounding picnic areas, nature trails, and tennis courts;
- Urban zones of 100-200 feet surrounding housing areas, individual residences, office buildings, and other high-use buildings;
- Streamside management zones of at least 50 feet on streams and wetlands;
- Pond zones of 100 feet from the edges of ponds and lakes; and
- Bald eagle management zones as determined by DGIF and the USFWS (refer to Section 2.5.5 for complete buffer requirements and definitions).

The approach to forest management provides for the sustainable harvest of forest products while managing forested ecosystems at AFETA. The long-term forest management objectives of the forest management plan are:

- Forestlands suitable for timber production shall be intensively managed for restoration and improvement of forest resources.
- Allowable cut will be based on forest inventory data and will be regulated according to sustained yield and multiple-use management.

- Timber harvested from construction sites prior to construction activities must be disposed of in accordance with Navy Real Property policy (NAVFAC P-73).

The intensity of management and silvicultural systems implemented vary according to the various forest community types that occur at the installation. Existing pine (*Pinus taeda* and *Pinus virginiana*) and mixed stands of pine and yellow poplar (*Liriodendron tulipifera*) are managed fairly intensively for large diameter sawtimber production. Shelterwood and seed tree systems are primarily used, though clear cutting is used in situations where adequate seed trees are not available. Management practices favor mixed pine/yellow poplar stands over pine monocultures to reduce susceptibility to insect and disease attack and to improve biodiversity. Stands dominated by oaks, hickories, and other late successional species are managed less intensively with the primary goal of maintaining large, contiguous tracts of intact natural ecosystems. Forest operations in these stands include conducting partial overstory cuttings aimed at regenerating oaks and other late successional species. The most intensive management occurs on sites targeted for restoration. These sites generally occur in disturbed areas and are infested with invasive, non-native species and often have a high percentage of low quality native species with poor form. Clear cutting; treating the invasive species with prescribed burning, herbicides, or a combination of the two; and replanting are recommended for restoring such sites to a healthy, productive forested stand.

The Virginia Department of Forestry (VDOF) best management practices that include streamside management zone protection, skid trail and forest road layout standards, and road closure procedures in order to protect water quality would be implemented throughout all forest operations. Other forest operations that are conducted include pre-commercial and commercial thinning and control of undesirable and competing species. These timber stand improvements are utilized to enhance the value, growth, and species composition and to reduce vulnerability to insect and pest infestation on select forest stands. Standard practices that are implemented to enhance or protect wildlife habitat under the proposed plan include:

- Retaining living and dead trees of various species, sizes, and ages in harvest units;
- Piling and leaving logging debris in a patchy distribution throughout the harvested area; and
- Maintaining soft and hard mast producing trees such as dogwood (*Cornus florida*), sassafras (*Sassafras albidum*), and black cherry (*Prunus serotina*) in forest stands to provide an important food source for wildlife. Measures to ensure the protection of threatened and endangered species would include:
- Avoiding unauthorized activities in bald eagle (*Haliaeetus leucocephalus*) primary and secondary management zones as determined by the VDGIF and the USFWS and
- Conducting surveys for small whorled pogonia (*Isotria medeoloides*) in areas with suitable habitat and avoiding such areas if found.

Silvicultural Practices

Silvicultural systems that produce diverse stand structures are recommended for use at AFETA. Key elements in developing forest diversity include long rotations; retention of snags and cavity trees; use of prescribed fire; and protection from wildfire, insect outbreaks, and disease. Long rotations facilitate structurally complex forests that include large-diameter trees and old-growth characteristics. Retention and recruitment of living and dead trees of various species, sizes, and ages in timber stands are also necessary to maintain diverse forest structure. Individual snags evenly distributed over a harvested unit and/or aggregated clumps of snags left after a clearcut benefit many avian species. Forest stands that are aggregated whenever possible for the purpose of creating larger core areas minimize fragmentation effects. Silvicultural systems chosen for AFETA should optimize the ecological sustainability of forest resources while remaining consistent with the mission.

3.7 FISH AND WILDLIFE MANAGEMENT

The basic objectives for wildlife management are to protect and enhance wildlife resources insofar as the mission allows; provide recreational hunting for assigned base employees, their dependents, and special authorized hunters; and maintain wildlife populations within the carrying capacity of the land. The diversity of habitats on the installation supports a wide variety of game and non-game wildlife. The game species management system consists of three drivers, harvest, habitat development and habitat preservation, and includes:

General Best Management Practices for Wildlife Management

Several nuisance wildlife species occur on the installation, including beavers (*Castor canadensis*), ground hogs (*Marmota monax*), and nutria (*Myocastor coypus*). Wildlife damage control and management actions are divided into three primary categories: active management, habitat management, and interdepartmental coordination. Although nuisance species populations on the installation have not yet exceeded manageable populations, wildlife damage control and management practices, including the following, are in place on the installation:

- Coordinate and respond to complaints from installation personnel regarding nuisance wildlife pests;
- Maintain accurate records of nuisance wildlife handling for annual reporting;
- Coordinate maintenance and repair of installation buildings (i.e., warehouses and office spaces) that have a history of nuisance wildlife pests;
- Provide information and education for installation residents and workers on wildlife, nuisance wildlife, wildlife disease vectors (ticks, small mammals), and situations where wildlife becomes both nuisance and pest;
- Continue active management of observed nuisance wildlife (ground hogs, foxes, and beavers) when interference with operations or structures are noted; and
- Continue passive hunting of coyotes to maintain appropriate predator levels and minimize effect on mammal and bird populations.

Habitat Management – Forests

Wildlife habitat on AFETA is largely dependent on forest management practices because the extensive forested acreage on the installation. Ecosystem management guidelines specify that management of the installation should not necessarily optimize the habitat for any one species, but provide a diversity of habitat types and components for a wide variety of species. A number of actions can be taken to effectively manage the forestland for a diversity of forest resources. For example, snag retention in harvested units provides habitat for cavity-nesting birds and mammals. Leaving dead and downed woody debris mimics old-growth characteristics and provides important habitat for small mammals and herpetofauna. Minimizing forest fragmentation benefits forest interior species such as neotropical migrant birds and also contributes to more efficient timber operations. All of these characteristics are present to varying degrees and have contributed to species diversity on AFETA.

Forest stand characteristics such as size, shape, age, age class distribution, species composition, and density affect wildlife habitat; as do forest management practices such as rotation length, regeneration, controlled burning, and thinning. Habitat variety or diversity is central to the theme of optimum wildlife habitat and is generally associated with wildlife diversity and abundance. Integrating these concepts with other land management practices on the installation permits sound planning that benefits wildlife.

Stand size and shape are primary habitat components for most wildlife. Smaller stands generally have more between-stand diversity and more value for certain wildlife than large contiguous stands; however, unless stands

are connected by corridors and streamside management zones, they may become fragmented into scattered islands too small to support breeding populations. A mosaic of natural and intensively managed stands provides a large amount of habitat variety. Irregularly shaped stands provide more diversity than square blocks because food and cover areas are more likely to be intermixed over a large area.

Many wildlife species are tolerant of a wide range of habitat conditions produced in various stand ages. Young timber stands (less than seven years) typically produce an abundance of food and cover for wildlife, but as the trees grow and develop a canopy, understory shading increases and production declines for most wildlife. Distribution of various stand age-classes throughout a forest contributes to habitat diversity for wildlife. Adjacent stands should be different in age by at least seven years. As stands mature, timber density decreases from thinning or natural succession, understory development increases from sunlight penetrating the canopy, and hardwood trees (if allowed to persist) begin to produce mast that is edible by wildlife.

Timber harvest and stand regeneration may have the most profound effect on wildlife habitat of all forest management activities. Long rotations (about 80 years between timber harvests for pine and 120 years for hardwoods) will generally produce better habitat for wildlife than short-rotation management. Longer rotations allow for greater flexibility in the use of management techniques for producing adequate supplies of forage over a longer period by maintaining mast production, plant species diversity, and habitat variety. Even-aged (clear-cutting) and uneven-aged (selective harvest) timber management can accommodate wildlife when conducted with due consideration for wildlife values. Natural stand regeneration benefits wildlife more than intensive site preparation and planting. A greater variety of woody and herbaceous vegetation generally occurs in naturally regenerated stands.

Prescribed burning can be used to improve wildlife habitat by maintaining a subclimax stage of succession that is important to many wildlife species. Usually a three-year winter burning rotation is recommended to improve and maintain the quantity and quality of understory vegetation for wildlife. Nutrient content of browse plants is higher on burned areas than on unburned areas. However, burning in hardwoods is often detrimental; therefore, burning frequently enough to eliminate hardwoods should be avoided.

Habitat Management – Forest Edges

Edge is a term used to describe interfaces between different vegetative communities and/or different successional stages. These interfaces can be abrupt or transitional. Abrupt edges generally attract animals with low cruising radius, such as small mammals or birds with small territories. Transitional edges attract more species of wildlife than do abrupt edges. Most edges at AFETA are very abrupt, with closely mowed grassland along roadways often interfacing with mature timber. One way to improve the edges along roadways in order to attract more species diversity is to allow for a 40 to 60 foot zone of native grasses and forbs to mature, with mowing occurring only once a year. It would be preferable to mow in early to mid-July after initial nesting is over, but in time to allow re-growth for cover for the upcoming winter and the next season's nesting. Following this pattern will provide cover for animals as they traverse from woods to the mowed grassy areas in which they forage. Reduced mowing would have the additional benefit of saving revenue on mowing contracts. Interpretive signs can be posted to explain that the change in appearance is due to wildlife habitat enhancement efforts.

Habitat Management – Abandoned Agricultural Fields

Retaining the abandoned agriculture fields of the installation will help maintain a higher level of diversity. Currently, tall fescue (*Festuca elatior*), broomsedge (*Andropogon virginicus*), little bluestem (*Schizachyrium scoparium*), quackgrass (*Agropyron repens*), sedges, and rushes dominate these areas. Strategies for increasing wildlife value of this area may include the creation of food plots or conversion to a native warm season grass meadow. Planting food plots of grain sorghum, corn, sunflowers, alfalfa, and ladino clover would create high energy and protein sources for wildlife. Areas not converted to food plots would be well suited for establishment of warm season grasses such as eastern gama grass (*Tripsacum dactyloides*), switchgrass (*Panicum virgatum*), and prairie cordgrass (*Spartina pectinata*) in wetter areas. Generally dense stands of fescue must be eradicated prior to the establishment of native warm season grasses.

Another consideration for establishing food plots at AFETA is that predators of small game are quick to learn where their prey routinely feed and will typically intensify their predation efforts at these locations. If food plots are either disked or planted for quail, rabbits, or as brooding grounds for turkey, the plots should not be less than five acres and should be surrounded by adequate transitional soft edge that can be utilized as escape cover. Otherwise, an ecological trap for small game may have inadvertently been created.

Habitat Management – Fisheries

There are four ponds managed as recreational warm water ponds and available for catch and release fishing: Powell Lake, Bass Lake, Bigler Mill Pond, and Skimino. Beaverdam Pond is managed for waterfowl and is not used as a fisheries resource. Fisheries management assistance is provided to the installation by USFWS including relocation of fish during times of pond or lake drawdown for construction activities as well as stocking support. Gasoline powered boats are not permitted for recreational use on the lakes with non-motorized fishing boats and canoes available for use by base residents and students. Boat launching facilities are available on the two locations on the base: Porto Bello on Queens Creek and the mouth of Carter's Creek on the York River. Freshwater fish identified within the ponds on AFETA include species such as bass and sunfish.

The watersheds of these ponds consist primarily of mature forest land. The mature forest cover protects the watershed and prevents rapid evaporation of rainfall, providing adequate volumes of water for ponds. The Forest Management Program at AFETA ensures that these watersheds remain protected and viable. Viable forests are maintained by conducting normal timer cutting to maintain vigorously growing, healthy stands. Large clear cuts in these areas are avoided to the greatest extent practicable; however, the pond edges will receive modified cuts to ensure prevention of sedimentation as well as ensure the aesthetics of the ponds. Best management practices to minimize runoff erosion are implemented at every stage of forest manipulation.

The following recommendations apply to all fishing ponds:

- Manipulate water levels to control adequate vegetation and improve fish populations;
- Install fish attractors or brush shelters to congregate fish and improve fisherman success;
- Construct floating docks or piers to allow more non-boat fishing access;
- Enforce creel and size limits to prevent overfishing; and
- Continue supplemental fish stockings to introduce new species and to augment existing depressed populations.

Species Management – Waterfowl

AFETA continues to enforce the DGIF imposed time of year restrictions (TOYR) regarding several waterfowl species observed on the installation, including great blue heron (*Ardea herodias*), great egret (*Ardea alba*) and green heron (*Butorides virescens*). Two heron rookeries are known to exist on the installation: one on the northern part of the base along Skimino Creek and one on the southern part of the base along Queens Creek.

A TOYR is in place February 15- July 31 for activities within 0.25 mile of the rookeries or within 0.5 mile of the rookeries if the project involves high density activity; and a 500-foot undisturbed naturally vegetated buffer must be maintained around each rookery.

The VDGIF and USFWS, respectively, exercise state and federal authority over conservation and management of ospreys (*Pandion haliaetus*) in Virginia. Males typically arrive on their breeding territories one to two weeks before females, with mating activity commencing immediately after arrival of the female. Eggs are typically laid in April and are incubated by the female for 35-37 days. The young remain in the nest for approximately 8 weeks after hatching. Most young are capable of sustained flight by late June or early July; yet, after fledging from the nest, the young remain dependent on the parents for up to 2 months.

An inactive nest is defined as a nest without any eggs or dependent (flightless) young and includes nests under construction. Inactive nests should only be removed if the nest or placement of the nest poses a threat to property integrity, human health, or safety. No authorization or consultation is required for removal of inactive nests from 16 September through 15 April. Inactive nests should only be removed upon written confirmation of nest status (as inactive) by VDGIF.

An active nest is defined as a nest containing eggs or occupied by dependent (flightless) young. All reasonable measures to protect an active nest until the young fledge must be considered before authorization to relocate or remove the nest is sought. Removal of active nests is generally not permitted, but a nest may be relocated or removed if it poses a direct threat to human health or safety; or when the birds, nest, or eggs themselves are threatened unless they are moved. In rare situations, relocation or removal of a nest that merely constitutes a nuisance may be authorized if it interferes with the intended use of the structure. Anyone seeking to have an active nest relocated or removed must contact the VDGIF or the USFWS in advance. To comply with Virginia law and VDGIF regulations, active nest relocation or removal may only be undertaken by an authorized federal, state, or local employee in the performance of their official duties as provided in 4 VAC 15-30-50, or by an individual authorized by USFWS for the nest removal. To comply with federal law, active nest relocation or removal may only be undertaken by an individual authorized by the USFWS for the relocation or removal.

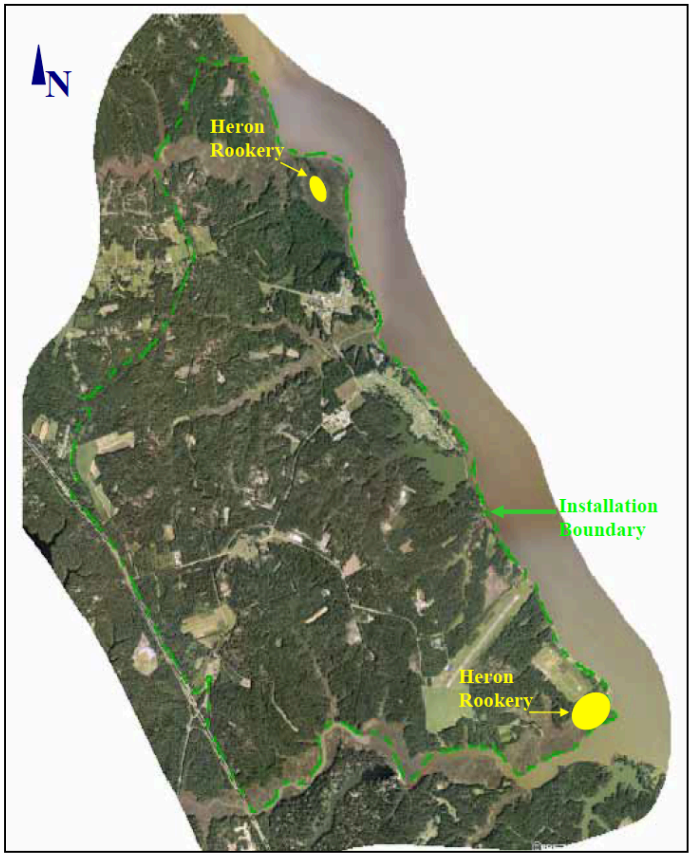


Figure 3-1: Locations of heron rookeries located on AFETA.

Species Management – White-tailed Deer

The installation conducts an annual assessment of white-tailed deer to assess herd health and population by Natural Resources Branch staff and DGIF. The annual deer harvest is tracked for numbers of animals taken and the health of the herd. Population management decisions are made by the Wildlife Management Board based upon the data and following general recommendations. Hunting is the primary management tool for thinning deer herds.

The spotlight census is performed annually, June through August, to study population trends, estimate population densities, and determine herd composition as it relates to sex and age. The spotlight data is coupled with technical check station data to evaluate the overall deer herd health and is used to formulate recommendations for deer harvest regulation changes. In 2016, the estimated fawn per doe ratio and the average number of deer harvested per year was utilized to estimate the total population of deer on base. The installation contains approximately 8,100 acres of deer habitat and provides for an annual deer population of approximately at 846 deer, of which the ratio is 1:1 for doe versus buck. Future monitoring efforts may be supplemented by an infrared monitoring program.

Table 3-1. AFETA white-tailed deer harvest data from 2011 – 2016

Hunting Season	***Deer Harvest Per Animal Class***			
	Total	***Bucks***	***Does***	***Fawns***
2012	350	126	11	76
2013	379	158	151	65
2014	214	68	87	59
2015	266	104	141	21
2016	197	64	95	38

Species Management – Eastern Wild Turkey

Eastern wild turkeys (*Meleagris gallopavo silvestris*) are ground nesters that typically lay 9 to 12 pale brown or purple eggs with brown spots. The incubation period is approximately 26 days. Poults are ready to follow the hen 12 to 24 hours after leaving the egg while broods spend most of their early days searching for and eating a variety of small insects. An optimal turkey range consists of large tracts of mature forestland with scattered patches of

early successional stages interspersed throughout. General telemetry studies indicate that a minimum area of 1,000 acres is needed for a viable flock. A population that could support 100 hunter days per year would require 5,000 acres of suitable range.

Open areas for insect foraging are important for wild turkeys and should comprise approximately one third of the bird's home range. Within the forested areas of AFETA, open areas comprise far less than this optimal level of interspersion. Open areas are also important for courtship and nesting. The highest turkey densities are found in areas where wet hardwood bottoms abut thinned pine plantations, young clear-cuts, and agriculture fields. Nesting habitat includes a variety of habitat types such as wood's edge, old fields, rights-of-way, and young (less than five years old) pine plantations. Thinned pine plantations have also proven to be desired nesting sites and offer good nesting cover if abundant ground vegetation is present. Thinning the considerable acreage of overstocked pine at AFTEA would increase the amount and quality habitat for turkeys.

Tall fescue plantings should be avoided if an increase in turkey population numbers is a goal. Instead, native grass plantings should be encouraged. A dense herbaceous layer with forbs, grass, vine, and brush components are excellent nesting habitat. Late winter burning, mowing, or bush-hogging at intervals of two to three years, can be used to achieve this end. Springtime field activities should take into account the potential for disruption of nesting activities from mid-May to mid-July. Preferred turkey foods are acorns, wild grapes, flowering dogwood, American beautyberry, blackberry fruits, soybeans, and clovers. Other fleshy fruit and nuts, as well as sedges and ferns, are important during the fall and winter. Insects with high protein content is a critical food source to broods during the spring for survival and growth.

Seasonal trapping of mammalian nest predators, i.e., raccoons, skunks, cotton rats, and opossum, prior to and during turkey nesting season (February through June) might increase wild turkey nesting success. However, this strategy is experimental and would be just one component of a comprehensive, habitat enhancing management approach. Other ground-nesting species such as bobwhite quail and whip-poorwills might benefit from this approach as well.

Species Management – Cottontail Rabbits

Cottontail rabbits (*Sylvilagus floridanus*) typically breed from March through September. Two or three litters are commonly born in one season, but as many as five have been produced in certain areas. The period of gestation varies from 25 to 32 days, and the litter varies in size from three to eight rabbits. The young are blind at birth and remain in the nest for about two weeks. The cottontail population is limited by suitable habitat at AFETA as there is relatively little early successional habitat available; and possibly by a healthy population of gray fox.

Eastern cottontails are a generalist species associated with early successional stages of habitat. Herbaceous vegetation of almost any kind, buds, and twigs are typical foods throughout the year. Escape cover comprised of thickets, brush piles, and unmowed grasses are important for daytime foraging, and open area are important for nocturnal feeding. Home range size varies between two and ten acres depending on habitat quality. A variety of habitat types present within a ten-acre area is optimal. Reducing mowing in the agricultural field to every two to three years and allowing hedgerows to grow in around existing roads, fence lines, and drainage ditches would improve habitat for cottontail rabbits. In dense pine stands, prescribed burning at three- to five-year intervals would also improve habitat for rabbits.

In areas where there is little natural cover, constructed brush piles can provide escape cover for rabbits. Brush piles can be constructed by using logs, pallets, concrete blocks, pipes, or other materials to serve as a base. If using logs, layers of six-inch diameter logs should be stacked at right angles to each other to make a base for the pile. Logs within each layer should be six to ten inches apart. Tree tops, limbs, and stumps should be placed on top of the base to complete the pile. The best size for a brush pile is four to eight feet high and 10 to 20 feet in diameter. Well-constructed brush piles can last 10 to 15 years. At the edges of wooded areas, one brush pile every 200 to 300 feet will provide adequate cover and travel lanes. Piles should be placed along forest edges, in openings and field corners, or along streams and marshes. They should be placed in close proximity to food sources and natural cover, because isolated piles will receive little use. Because cottontails attract large raptors such as Red-tailed Hawks, improving habitat and placing brush piles near the runway clear zone would not be appropriate.

Species Management – Bobwhite Quail

The bobwhite quail (*Colinus virginianus*) is primarily a species of early successional plant communities. Home range sizes vary between 20 and 40 acres and seldom exceed 80 acres (Bidwell et al. 1992). An average density on intensely managed areas is one covey per 15 acres. The diet of adults consists of seeds and fruits of cultivated crops, wild herbaceous plants, and woody plants. Insects are the primary food for quail during the first few weeks of life.

For nesting cover, bobwhites prefer warm season grass clumps left from the previous growing season. Most nests are within 50 feet or less of an open edge. Little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), eastern gamma grass (*Tripsacum dactyloides*), weeping lovegrass (*Eragrostis curvula*), and broomsedge *(Carex scoparia*) make up the majority of preferred nest habitats. An extremely important feature of good quail habitat is cover that is open at the ground level. Vegetation should provide protection, but plant stems need to be far enough apart and the ground bare enough to allow the birds to move freely. Tall fescue is often sod-bound and has been found to entangle immature quail and indirectly lead to starvation and predation. Conversion of fescue stands to native warm season grasses and forbs may be used to improve quail habitat. One to two-year-old fallow fields where thin grasses and tall perennial forbs abound are the preferred roosting habitat of the bobwhite. Woody thickets with a dense understory of honeysuckle are preferred roosts for enduring severe weather.

Quail begin breeding as early as mid-February. The first bobwhite whistle of spring is a sign that the mating period has begun. The nesting period commences in late April or early May and continues until late summer. Egg laying may take up to 20 days, and the average clutch size is 14 although it can vary widely. Incubation takes approximately 23-24 days.

Species Management – Eastern Gray Squirrel

The Eastern gray squirrel (*Sciurus crolinensis*) currently provides the most popular form of small game hunting on the installation. Gray squirrels primarily inhabit the mast-producing hardwood and pine hardwood stands on the installation and subsequently the populations of squirrels have fluctuated with the abundance of mast crops. During the years of poor mast production, pine seeds are an important part of the squirrel diet. Long timber rotations are essential to squirrel populations. Large mast-producing trees provide excellent mast for squirrels and also provide desirable den trees. Timber harvest operations are designed to leave a number of mast-producing and

potential den trees in cut areas for providing sufficient food for squirrels. In addition, key squirrel producing areas will consist of mature stands of mixed hardwoods.

Species Management – Amphibians

Coastal Virginia supports a wide diversity of amphibians including frogs, toads, and salamanders. Many of these species are declining due to loss of wetlands and use of pesticides. To favor current populations of amphibians at AFETA, the installation should continue to maintain fishless pools for amphibian breeding, egg-laying, or the juvenile stage of development. Some salamanders may only breed in forest pools within mature hardwood forests; therefore, to prevent the further degradation of salamander habitat, stream channelization should not be permitted in any unditched areas. To improve habitat in areas where flooding will not cause mission related problems, blocking ditches will slow down flow and create the required pools and wet areas. Although larger pools tend not to dry up frequently, they may attract green frogs and bullfrogs, which are the primary predators of many other amphibians; and therefore, do not provide as good breeding habitat as smaller pools.

Species Management – Cavity Nesting Birds

A variety of cavity nesting birds occur on the installation and throughout the region, including bluebirds, chickadees, and woodpeckers. The use of artificial nest boxes and other structures is a way of enhancing bird habitat in areas where there are few natural cavity trees or where competition from aggressive non-native species, such as house sparrows (*Passer domesticus*) and European starlings (*Sturnus vulgaris*), is great. Nest box construction and placement should consider the availability of appropriate habitat for the intended species. Bluebird nest boxes, for example, should be placed five to six feet off the ground and spaced about 100 yards apart with the entrance hole facing north or northeast. Boxes should be placed in an area comprised of mixed hardwood forests and grassland such as along the wood line at the abandoned agricultural field. Although they are not cavity nesting birds, species such as purple martins and barn swallows will also use artificial structures for nesting. Purple martin houses should be comprised of several compartments and should be placed in clearings at least 30 feet from trees. Barn swallows will use simple platforms attached to buildings. It is important to locate nest boxes and platforms away from doorways or high traffic areas to prevent bird droppings from becoming a nuisance, as well as to avoid disturbing the birds.

3.8 PROTECTED SPECIES

Species Management – Neotropical Migrant Birds

Birds that breed in the United States and Canada that journey south to spend the winter in the Caribbean, Mexico, and southward are known as neotropical migrants. Thrushes, warblers, vireos, and tanagers are probably the most familiar of the neotropical migrant songbirds. But this group actually comprises a large number of diverse species including waterfowl, shorebirds, terns, hawks, flycatchers, and hummingbirds. The decline of neotropical bird populations is a great concern to scientists and birdwatchers and has instigated the formation of such groups as Partners in Flight (PIF), a partnership of DOD, other state and federal agencies, and private organizations. A key activity of PIF is the development of a bird conservation plan for every physiographic area in the United States. As declines in bird populations are primarily contributed to loss of habitat and habitat fragmentation, conservation strategies developed by PIF concentrate on maintaining healthy and productive natural systems at the landscape level. Because of the rapid pace of development and the abundance of agricultural lands in the region, the extensive forested land at AFETA provides particularly important stop over grounds for neotropical migrants during their spring and fall migrations. Preserving large tracts of mature forest, creating and maintaining forested

riparian buffers, and leaving snags in managed forests are ways of continuing to provide habitat for many neotropical migrant species.

The installation of artificial nest boxes and other structures is a way of enhancing bird habitat in areas where there are few natural cavity trees or where competition from aggressive non-native species such as house sparrows and European starlings is great. Bluebirds, purple martins, barn swallows, and bats are species that commonly utilize artificial structures. Nest box construction and placement should consider the availability of appropriate habitat for the intended species. Bluebird nest boxes, for example, should be placed five to six feet off the ground and spaced about 100 yards apart with the entrance hole facing north or northeast. Boxes should be placed in an area comprised of mixed hardwood forests and grassland such as along the wood line at the abandoned agricultural field. Purple martin houses should be comprised of several compartments and should be placed in clearings at least 30 feet from trees. Barn swallows will utilize simple platforms attached to buildings. It is important to locate nest boxes and platforms away from doorways or high traffic areas to prevent bird droppings from becoming a nuisance. Brown bats and little brown bats are the most likely occupants of bat houses, which should be placed within a half of a mile of a marsh or open water where insect populations are high.

Species Management – Bald Eagle

The bald eagle is a large (30 to 43 inches tall) raptor with an approximate seven-foot wingspan. Adults are light to chocolate brown, with a white head and tail. Juvenile and sub-adult plumage is highly variable, ranging from brownish-black to a light mottled tan, with white spotting and marbling on wing linings and flight feathers. In general, the body becomes lighter each year until the third or fourth year when adult plumage is attained. The bald eagle is an opportunistic predator that primarily feeds on fish but will eat various birds, mammals, and turtles as either live prey or as carrion when fish are not available.

Bald eagles 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. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags located in reservoirs provide the visibility and accessibility needed to locate aquatic prey. Eagle nests are constructed with large sticks, and may be lined with moss, grass, plant stalks, lichens, seaweed, or sod. Nests are usually about 4-6 feet in diameter and 3 feet deep.

To provide consistent management of the bald eagle, USFWS developed the National Bald Eagle Management Guidelines (USFWS, 2007). This guidance states that in general, activities should be kept as far away from nest trees as possible; loud and disruptive activities should be conducted when eagles are not nesting; and activity between the nest and the nearest foraging area should be minimized. Nesting and breeding season in Virginia is October-August. USFWS has separated potential bald eagle disturbing activities into eight categories based on the nature and magnitude of the impacts that usually result. AFETA will determine which category the proposed activity falls into and will follow the USFWS recommendations listed below. Management zone buffers, determined by distance, serve to minimize visual and auditory impacts associated with human activities near nest sites. Any activity taking place within the appropriate management zone buffer for both active and inactive nests needs coordinated and potentially permitted by USFWS. Management recommendations for the broader

categories of A and B are listed in Table 3-2. Management recommendations for the more specific categories of C-H are listed beneath the category description.

Table 3-2. Management recommendations for the broader categories of A and B.

		Similar activities nearby the nest site	
		If there is no similar activity within one mile of the nest	If there is similar activity closer than one mile from the nest
Degree of visibility of activity from the nest site	If the activity will be visible from the nest	A 660 feet landscape buffer is recommended.	Activities may occur at 660 feet, or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
	If the activity will not be visible from the nest	Activities falling within Category A should be avoided within 330 feet of nest. Clearing, external construction, and landscaping between 330 feet and 660 feet should be done outside breeding season. Activities falling within Category B should be avoided within 660 feet of nest.	Activities may occur at 330 feet or as close as existing activity of similar scope is tolerated by the eagle. Clearing, external construction, and landscaping within 660 feet of the nest should be done outside breeding season.

Category A – Building construction, one or two stories, with project footprint of half an acre or less; Construction of roads, trails, canals, power lines, and other linear utilities; new or expanded agriculture and aquaculture operations; alteration of shorelines or wetlands; installation of docks or moorings; and water impoundment.

Category B – Building construction, three or more stories; building construction, one or two stories, with project footprint of more than half an acre; installation or expansion of marinas with a capacity of six or more boats; mining and associated activities; oil and natural gas drilling and refining and associated activities.

Category C – Timber Operations and Forestry Practices (as indicated in the Forest Management Plan).

- Avoid clear cutting or removal of overstory trees within 330 feet of the nest at any time.
- Avoid timber harvesting operations, including road construction and chain saw and yarding operations, during the breeding season within 660 feet of the nest. The distance may be decreased to 330 feet around alternate nests within a particular territory, including nests that were attended during the current breeding season but not used to raise young, after eggs laid in another nest within the territory have hatched.
- Selective thinning and other silviculture management practices designed to conserve or enhance habitat, including prescribed burning close to the nest tree, should be undertaken outside the breeding season. Precautions such as raking leaves and woody debris from around the nest tree should be taken to prevent crown fire or fire climbing the nest tree.
- If it is determined that a burn during the breeding season would be beneficial, then, to ensure that no take or disturbance will occur, these activities should be conducted only when neither adult eagles nor young

are present at the nest tree (i.e., at the beginning of, or end of, the breeding season, either before the particular nest is active or after the young have fledged from that nest). Appropriate Federal and state biologists should be consulted before any prescribed burning is conducted during the breeding season.

- Avoid construction of log transfer facilities and in-water log storage areas within 330 feet of the nest.

Category D – Off-road vehicle use. No buffer is necessary around nest sites outside the breeding season. During the breeding season, do not operate off-road vehicles within 330 feet of the nest. In open areas, where there is increased visibility and exposure to noise, this distance should be extended to 660 feet.

Category E – Motorized Watercraft use (including jet skis/personal watercraft). No buffer is necessary around nest sites outside the breeding season. During the breeding season, within 330 feet of the nest, (1) do not operate jet skis (personal watercraft), and (2) avoid concentrations of noisy vessels (e.g., commercial fishing boats), except where eagles have demonstrated tolerance for such activity. Other motorized boat traffic passing within 330 feet of the nest should attempt to minimize trips and avoid stopping in the area where feasible, particularly where eagles are unaccustomed to boat traffic. Buffers for airboats should be larger than 330 feet due to the increased noise they generate, combined with their speed, maneuverability, and visibility.

Category F – Non-motorized recreation and human entry (e.g., hiking, camping, fishing, hunting, birdwatching, kayaking, canoeing). No buffer is necessary around nest sites outside the breeding season. If the activity will be visible or highly audible from the nest, maintain a 330-foot buffer during the breeding season, particularly where eagles are unaccustomed to such activity.

Category G – Helicopters and fixed-wing aircraft. Except for authorized biologists trained in survey techniques, avoid operating aircraft within 1,000 feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity.

Category H – Blasting and other loud, intermittent noises. Avoid blasting and other activities that produce extremely loud noises within 1/2 mile of active nests, unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area. This recommendation applies to the use o fireworks classified by the Federal Department of Transportation as Class B explosives, which includes the larger fireworks that are intended for licensed public display.

Species Management – Small Whorled Pogonia

Small whorled pogonia is a self-pollinating perennial orchid (Family: *Orchidaceae*), four to twelve inches in height, with a characteristic whorl of five to seven leaves at the summit of a singular, hollow, pale green stem with one or two pale yellowish-green irregular flowers (Mehrhoff, 1983; Gleason and Cronquist, 1991; Vitt and Campbell, 1997). Morphologically similar species include large whorled pogonia (*Isotria verticillata*) and Indian cucumber root (*Medeola virginiana*), the former distinguished from small whorled pogonia by a reddish-purple stem and the latter by a wiry stem with cotton-like hairs (Ware, 1991).

Small whorled pogonia occupies a very specific habitat type within its range. In particular, the species seems to require the following conditions: mature, mixed hardwood, upland forests; generally open understory conditions with minimal aggressive ground level species; generally level to moderately sloping land within shallow upland draws often, but not always, of northerly or easterly exposure; scattered ground-level sunlight; and, acidic, sandy

loam soils (Ware, 1991; Gleason and Cronquist, 1991; Weakley, 2010). In addition, many professionals have noted a prevalence of decaying logs and a well-developed detritus layer on the forest floor. These attributes tend to be present with the species when found, although the exact mechanisms associated with each affinity are not understood (Ware, 1991).

When projects on the installation have the potential to occur within the described habitat, detailed field surveys for potential habitat and individuals must be conducted. Detailed field surveys of appropriate habitat areas must be completed within the recommended survey window for the region, as suggested by USFWS (May 25-July 15). Surveys for small whorled pogonia are valid for a period of two years. Any areas classified as poor habitat do not require surveys and should be excluded from future survey requirements, barring any significant changes to habitat structure.

Species Management – Anadromous Fish

The York River has been identified as a confirmed Anadromous Fish Use Area. Anadromous fish migrate long distances from salt water to spawn in freshwater, and are vulnerable during these migrations. The DGIF has specific TOYRs for certain activities within Anadromous Fish Use Areas. In the portion of the York River where the installation is located, the TOYR for instream work is February 15 - June 15. There is a known, distinct population of Atlantic sturgeon, an anadromous fish, which has been documented in the York River. As such, any activities which require in-stream work in the York River require consultation with the USFWS and DGIF. A number of BMPs may prevent impacts to anadromous fish, such as use of turbidity curtains and not blocking a significant portion of the waterway, which would serve as a barrier to fish passage.

Species Management – Northern Long Eared Bat

The northern long-eared bat (*Myotis septentrionalis*) is federally listed as a threatened species under the Endangered Species Act. Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. This bat has rarely been found roosting in structures, like barns and sheds. No individuals of these species have been documented on AFETA to date. No surveys have been completed on this species; however, AFETA complies with the time of year restriction from June 1 through July 31 of any given year during which no tree harvesting can occur onsite

3.9 GROUND MAINTENANCE

AFETA implements the following grounds maintenance procedures and best management practices where cost effective and practicable:

- Use regionally native plants for landscaping so as to prevent the invasion of weed and nonnative species such as kudzu, phragmites, Johnson grass, and microstegium;
- Design, use, or promote construction practices that minimize adverse effects on the natural habitat;
- Reduce fertilizer and pesticide use by using integrated pest management techniques, recycling green waste, and minimizing runoff;

- Implement water efficient practices such as the use of mulches, efficient irrigation systems, audits to determine exact landscaping water needs, using recycled or reclaimed water for irrigation purposes, and selecting and locating plants in a manner that conserves water and controls soil erosion; and
- Create outdoor demonstrations incorporating native plants, as well as pollution prevention and water conservation techniques, to promote awareness of the environmental and economic benefits of implementing this directive.

3.10 ENVIRONMENTAL RESTORATION PROGRAM

Users of this INRMP are directed to the following documents for further information regarding the Environmental Restoration (ER) Program:

- Military Munitions Response Program Preliminary Assessment for AFETA (2012). Prepared by CH2MHill, Virginia Beach, Virginia; and
- Site Management Plan Fiscal Year 2018 for AFETA (2017). Prepared by CH2M HILL, Inc., Virginia Beach, Virginia.

The AFETA ER program is a component of the DOD Environmental Restoration Program (DERP), which is one of the programs established by the DON under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (46 U.S.C. §19601) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986. As part of the fiscal year 2002 Defense Authorization Act, Congress additionally mandated that DOD and the military components develop a program to address military munitions as part of DERP. As a result, the ER program was developed, which includes the Installation Restoration (IR) program and the Munitions Response (MR) program.

The purpose and scope of the IR program is to identify, assess, characterize, and cleanup or control contamination from past waste disposal operations and spills. The nature and extent of past operations within the boundaries of AFETA presents historical environmental concerns involving potential material releases that may be harmful to human health and the environment. These materials, if released into the environment, could lead to damage of natural resources. This potential was recognized and actions are being taken to investigate and clean up previously disposed of materials that have the potential to pose unacceptable risks. The MR program addresses munitions and explosives of concern, including unexploded ordnance, discarded military munitions, and munitions constituents, either at concentrations high enough to present an explosive hazard or at concentrations not presenting an explosive hazard but potentially presenting an environmental impact) at "other-than-operational" military ranges and other sites (i.e., closed, transferred, and transferring military ranges and sites not located on or within an operational range). The investigations and remedial activities of IR sites and MR areas performed at AFETA follow the guidelines of the CERCLA process; however, certain elements are tailored to address the unique safety aspects of munitions and explosives of concern.

Potential IR sites on the installation have been identified through site reconnaissance, document reviews, and interviews of AFETA personnel. Additional IR sites and areas of interest have been discovered by activity personnel over time. Through the CERCLA process, many sites were determined to be active compliance sites (e.g., underground storage tank program sites) or lacking a CERCLA release and are not included in the IR program. Currently there are 5 active IR sites on the installation (Site 41C, Site 49D, Site 51, Site 61, and Site 62). Site descriptions, investigations, and actions of active IR sites are discussed in the *Final Site Management Plan Fiscal Year 2018*.

MR areas on the installation have been identified through review of archival and activity records, onsite surveys, and interviews with personnel. Areas known to require additional investigation/evaluation are identified as Munitions Response Areas (MRAs), while those which may potentially be closed under the MR program, as part of a preliminary assessment, are identified as Munitions Response Areas of Interest (MR-AOIs). Four MRAs (MRA-1 through MRA-4) and 20 MR-AOIs (MR-AOI 1 through MR-AOI 20) were initially identified. Of those, MRA-2, MRA-3, MRA-3A, and MRA-4 remain as active MR sites. Four others (MRA-1, MRA-AOI1, MRA-AOI2, and MRA-AOI3) are within active range surface danger zones (SDZ); as such, investigation of these sites can only occur when the range the area is associated with is closed, or if the SDZ is altered. The others have been closed as they require no further action or are being addressed in association with another site. Site descriptions, munitions and explosives of concern, munitions constituents, contaminant migration and receptors, and management recommendations for each MRA are discussed in the *Military Munitions Response Program Preliminary Assessment for AFETA Camp Peary* (2012) and the current site status for each MRA and MR-AOI is provided in the *Final Site Management Plan Fiscal Year 2018*.

Natural resources management may be constrained in most of these areas, given their nature and limited access. Hunting is limited in both IR and MR areas on the installation. In addition, there are currently seven operational ranges on the installation in which access to the range fan and SDZ is limited for the majority of the year.

- **Range 3G** – This is an active arena-type demolition/detonation training facility located entirely within the Range 21 SDZ, in a valley south of Fawn Road and immediately upgradient of an unnamed tributary within the Carter Creek watershed. The range and its SDZ are approximately 148 acres in size and are oriented to the north. In addition to bulk explosives, a variety of munitions are known to have been used at Range 3G. The use of other items, such as transformers in previous training activities, has resulted in the inclusion of Range 3G in the IR program as Site 17.
- **Range 37** – This range is located along the southeastern border of the installation along Target Road, adjacent to the York River. The range and terrestrial portion of its associated SDZ are approximately 14 acres and are oriented to the northeast. A large 40-foot high embankment is located along the eastern side of the range and serves as a backstop for projectiles.
- **Range 21** – This is an active small arm firing range located east of Buck Road in the west central portion of the installation. The range and its associated SDZ are approximately 985 acres in size and are oriented to the north. A 20-foot high embankment serves as the backstop to prevent bullets from traveling beyond the range. MRA-1 is located within the Range 27 SDZ.
- **Natural Resources** – This is an active small arm firing range located adjacent to Range 21 within the same SDZ. The range contains a single firing lane and is approximately 0.25 acres in size, located east of Buck road in the west central portion of AFETA. The range is managed by the Natural Resources Department and is used as a qualifying range for hunters.
- **1000-inch Range** – This range is located west of Sioux Road and south of Warrior Road, in the north central portion of the installation, within the Range 21 SDZ. The range and its associated SDZ are approximately 0.8 acres in size. The range is managed by the Natural Resources Department and was previously used to qualify hunters to hunt on the installation.
- **Range 29** – This is a small arm firing range located south of Hawtree Landing Road. The range and its associated SDZ are approximately 312 acres in size and oriented to the southwest. The range facility contains an indoor shooting range and an outdoor shooting range comprised of four bays. In addition, a Judgmental Training Facility is situated within the boundary of the range, where personnel are subjected

to close-quarters combat scenarios. A sand berm approximately 60-feet long and 20-feet high is located behind a portion of the outdoor shooting range.

- **Range 33** – This range is located along the southern border of Hawtree Landing Road in the southwestern portion of the installation, near the main gate. The range and its associated SDZ are approximately 280 acres in size and are oriented to the east. The range contains an outdoor shooting range with a single bay for pistol/rifle firing, an outdoor shotgun range and a Judgmental Training Facility. A 20-foot high earthen/sand embankment is located along the eastern side of the outdoor range and serves as a backstop for projectiles fired from both ranges.

3.11 GREENHOUSE GAS EMISSIONS (GHG)

In compliance with new 2016 policy requirements, AFETA introduced procedures to evaluate all installation Federal actions for the potential to contribute to climate change by producing greenhouse gas emissions or alternatively, be affected by many of the impacts of a changing climate. AFETA's procedures allow for the evaluation of a level of predictability and certainty to describe these impacts by quantifying greenhouse gas emissions when conducting project evaluations. This increased predictability and certainty will allow AFETA to more fully understand the potential climate impacts of all proposed Federal actions, and in turn, assist in comparing alternatives and considering measures to mitigate the impacts of climate change.

The *Final Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change* (August 2, 2016) provides an approach as to how to describe climate change impacts, the guidance:

- Advises agencies to quantify projected greenhouse gas emissions of proposed federal actions whenever the necessary tools, methodologies, and data inputs are available;
- Encourages agencies to draw on their experience and expertise to determine the appropriate level (broad, programmatic or project- or site-specific) and the extent of quantitative or qualitative analysis required to comply with NEPA;
- Counsels agencies to consider alternatives that would make the action and affected communities more resilient to the effects of a changing climate; and
- Reminds agencies to use existing information and science when assessing proposed actions.

In order to better comply with the new regulations, AFETA completed a review of their NEPA procedures and documented updates to facilitate the consideration of GHG emissions and climate change during project reviews in order to:

1. evaluate the potential effects of a proposed action on climate change as indicated by assessing GHG emissions (e.g., to include, where applicable, carbon sequestration); and
2. determine the effects of climate change on a proposed action and its environmental impacts.

4.0 SUMMARY OF MANGEMENT RECOMMENDATIONS

Natural resources management recommendations for the installation, stemming from experience with past and ongoing programs as well as emerging techniques in land and range management, include guidelines that will help ensure that natural resources management maintains regulatory compliance and incorporates principles of ecosystem management. Recommendations also include a number of specific projects that will enhance and protect the natural resources on the installation. Each recommendation and project is assigned to one of three categories.

- **Environmental Compliance Recommendations (ECR)** – Management activities or recommendations that are compliance driven have been assigned the highest priority. Environmental compliance activities and recommendations are based on some type of compliance issue. The compliance issue may involve state or Federal regulations (including E.Os.), or be based on specific requirements for a permitted activity.

- **Environmental Stewardship Recommendations (ESR)** – Management activities or recommendations that are geared towards responsible environmental stewardship and which have the potential of transitioning into compliance issues, if ignored, are assigned the next highest priority. Environmental stewardship recommendations include actions that demonstrate the DOD's commitment to being the best possible stewards of the land entrusted to its care, and to maximize the extent to which it manages its natural resources for multiple uses.

- **Environmental Awareness Recommendations (EAR)** – Management activities or recommendations that are related to environmental awareness are assigned the lowest priority. These activities and recommendations serve to educate the public and DOD personnel about the natural resources entrusted in its care.

Natural resources program administration and day-to-day program activities are not included in these management recommendations. Recommended priorities for land and water conservation that can be accomplished are directly proportional to the financial, manpower, and equipment resources available. In addition, recommended priorities for land and water conservation may include (in no particular order):

- Those areas and conditions that directly affect operational, training missions, and ecologically sensitive areas;
- Those areas and conditions that directly affect the health, safety, and welfare of installation personnel; and
- Those areas and conditions that directly affect the safety of government property.

All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under Federal law. Nothing in this INRMP is intended to be nor must be construed to be a violation of the Anti-Deficiency Act of 1982 (31 U.S.C. § 1341 *et seq*.).

Table 4.1 Environmental Compliance Recommendations

ECR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
ECR-1	The installation is required to evaluate the human and environmental impacts related to all proposed installation actions using the NEPA process, as directed by all applicable Federal regulations, instructions and policy. These include, but are not limited to the *Procedural Provisions of NEPA* (40 Code of Federal Regulations (C.F.R.) Part 1500-1508), DON procedures for implementing NEPA (32 C.F.R. Part 775); and OPNAVINST 5090.1C. All NEPA documentation should be completed during the preliminary project design phase (generally not to exceed 30% design phase). Per NEPA, all Environmental Assessments and Environmental Impact Statements generated from proposed installation actions must be reviewed by the Commonwealth; this review is coordinated by the Office of Environmental Impact Review at DEQ.	National Environmental Policy Act	☐ Develop a NEPA project inventory which outlines the natural resource impacts associated with each project. ☐ Update inventory list prior to the finalization of the proposed NEPA document.	Ongoing – an environmental review is completed on every proposed action to determine the NEPA requirements. *Completed Action: updated NEPA project review documentation to include the evaluation of greenhouse gas emissions in all proposed actions*
ECR-2	All development and natural resource management projects should consult with the Environmental Manager to check for the documented or potential presence of threatened and endangered species within the project area and ensure compliance with Section 7 of the ESA.	Endangered Species Act-Section 7	☐ Conduct surveys for threatened and endangered species based on known species and habitat present. ☐ Consult with USFWS, DGIF, and DCR as appropriate.	Ongoing – a species review is completed on every proposed action to determine the ESA requirements. *Completed Action: Include evaluations of Northern long-eared bat, little brown bat, and tri-colored bat in all proposed actions*
ECR-3	Military construction and other mission-related activities should avoid state waters and WOUS located on the installation. When construction activities cannot avoid these areas, a jurisdictional determination and confirmation with the Corps in accordance with Section 404 of the CWA and E.O. 11990, should be completed before proceeding. All	Clean Water Act-Section 404	☐ When WOUS cannot be avoided, complete a jurisdictional determination and	Ongoing – a US Waters review is completed on every proposed action to determine the

ECR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
	appropriate Federal, state and local permits should be obtained before construction activities begin.		confirmation with the Corps. ☐ All appropriate Federal, state and local permits should be obtained before work in jurisdictional areas begins.	regulatory requirements.
ECR-4	BMPs for work in wetlands should be consulted and closely followed at all stages of a project.	Clean Water Act-Section 404	☐ All appropriate BMPs should be identified initially during the planning stages of a proposed action and implemented throughout the project.	Ongoing – a quality and quantity BMP review is completed on every proposed action to determine the regulatory and design requirements. *Completed Action: Coordinate with the Chesapeake Bay Program to provide FY project BMP data*
ECR-5	All activities on the installation requiring a Federal permit, including CWA Section 404 permits, must be reviewed by the Office of Environmental Impact Review at DEQ to ensure consistency with the VCP.	Coastal Zone Management Act	☐ Consult the list of enforceable policies under the VCP during the planning stages of a project to ensure consistency with the VCP.	Ongoing – a US Waters review is completed on every proposed action to determine the regulatory requirements. *Completed Action: Completed dam evaluations by the USACOE*

ECR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
ECR-6	Military construction and other mission-related activities must be reviewed for compliance with all applicable Federal, state and local stormwater management regulations and erosion and sediment control measures. These include, but are not limited to E.O. 13514, the CWA and Virginia's Stormwater Management Control Law. All appropriate Federal, state and local permits should be obtained before construction activities begin and all appropriate BMPs should be consulted and closely followed.	Energy Independence and Security Act, E.O. 13514 and Virginia Stormwater Management Law	☐ All appropriate sediment and erosion control plans and BMPs should be identified initially during the planning stages of a proposed action and implemented throughout construction. ☐ Use low impact development techniques whenever possible and practicable.	Ongoing – a quality and quantity BMP review is completed on every proposed action to determine the regulatory and design requirements.
ECR-7	BMPs for forestry should be consulted and closely followed, particularly whenever any forestry activity occurs on hydric soils.	OPNAVINST 5090.1C VDOF BMP Manual	☐ All appropriate BMPs should be identified before forestry activities begin and implemented throughout the activity.	Ongoing – a quality and quantity BMP review is completed on every proposed action to determine the regulatory and design requirements.
ECR-8	Use prescribed burning to reduce hazardous fuel accumulations, manage wildlife habitat, prepare sites for seeding and planting, control undesirable vegetation, improve access and aesthetics, encourage oak regeneration, and thin overstocked natural loblolly pine to allow for natural regeneration. Ensure that all prescribed burning is conducted in accordance with the burn permit authorizations and guidelines established by AFETA's Fire Chief. Prescribed burn plans and smoke management plans should be carefully developed for each event.	OPNAVINST 5090.1C	☐ All prescribed burning plans and BMPs should be identified during the planning stages and implemented throughout the activity.	As required.

ECR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
ECR-9	Document and monitor bird activity and grass height in the 250-acre clear zone surrounding the airfield in an effort to reduce BASH potential. In addition, monitor all current SWF within the airfield zone as well as evaluate potential implications of proposed SWMF. Team with Yorktown Naval Weapons Station and Cheatham Annex for BASH plan due to close proximity of waterway within 2 miles of airfield.	OPNAVINST 5090.1C	☐ Grass height manipulation can serve as a bird prevention activity as waterfowl typically do not loaf where the grass is not maintained as turf. ☐ Should a wildlife strike occur with an aircraft, the incident would be reported to both the Environmental Manager and the Natural Resources Manager and properly documented with the Navy and FAA.	All bird strikes are properly documented and all efforts are ongoing to maintain proper ground conditions as to reduce BASH occurrences.
ECR-10	Bring the two conceptual stormwater management plans to 100 percent design and combine with the SWMMP, while incorporating changes in state and Federal regulations. The two conceptual plans cover the major impervious areas on the installation. The incorporation of these plans and changes in regulations into the SWMMP will not only aid the installation in maintaining compliance with applicable regulations, but will also provide for improvements in the quantity and quality of stormwater runoff from development and redevelopment projects. A reevaluation of the contributing drainage areas for existing ponds, along with an analysis of the applicable associated removal capacity (if any) should be prepared. Water quality computations should be considered on a site-wide and subwatershed basis, in the context of required	Energy Independence and Security Act, E.O. 13514 and Virginia Stormwater Management Program Regulations	☐ Incorporate changes in Federal regulations and subsequent guidance documents regarding stormwater, and account for changes in the VSMP Regulations.	Ongoing – a quality and quantity BMP review is completed on every proposed action to determine the regulatory and design requirements.

ECR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
	removal rates associated with development and redevelopment activities. Pollutants should be tracked with a nutrient ledger for each existing facility serving as a BMP (if determined to be creditable as water quality treatment). Applicable stormwater management calculations should be updated in conjunction with recommended stormwater management associated with proposed site improvements on a site-specific basis (for compliance with Federal regulations for proposed development greater than 5,000 square feet), in consideration of maximum nutrient contributions per acre for the site, and in each identified subwatershed. For Chesapeake Bay TMDL compliance, credited facilities should be well documented and maintained in accordance with State standards, and if excess or limited stormwater treatment capacity is identified within the base area, offsite compliance options (per 4 VAC 5-60-69) and/or water quality trading could be considered. In coordination with water quality considerations, water quantity should be addressed on an outfall specific basis to identify inadequate outfalls requiring stabilization. Locations for points of analysis to monitor ongoing channel adequacy should be selected based on proximity to existing infrastructure and critical facilities, as well as in consideration of potential downstream erosion and sedimentation. Stabilization and restoration activities should be addressed in terms of pre- and post-development hydrology and evaluated for crediting towards site and subwatershed water quality compliance.		☐ Combine the three existing stormwater management documents and revise the SWMMP as necessary to account for inaccuracies within the document and review the efficacy of ongoing stormwater management practices.	

Table 4.2 Environmental Stewardship Recommendations

ESR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
ESR-1	Control invasive species (both flora and fauna species) across the installation using approved management practices, including but not limited to use of wetland approved herbicides, prescribed fire, and mowing without disturbing the soil. All invasive species control activities should follow the IPMP (2015). Plans for the control of individual invasive species should be developed and integrated into the IPMP (2015).	E.O. 13148 and Executive Memorandum 50737	☐ Only use native or naturalized plant species for grounds maintenance activities. ☐ Identify all appropriate BMPs during the planning phase of any project and follow the guidelines specified in the IPMP (2015). ☐ Obtain all required Federal, state, and local permits for invasive species management along shoreline.	Ongoing – all requirements are evaluated during design and construction phases to control invasive species.
ESR-2	Develop an operations and maintenance standard operating procedure for proper drainage of ditches that includes BMPs for minimizing soil disturbance as well as control of invasive species.	E.O. 13514	☐ The standard operating procedure should include BMPs for minimizing soil disturbance and control of invasive species. ☐ Proper drainage ditch maintenance allows for reduced erosion and sedimentation in the drainage	Ongoing with a Target Completion Date of Summer 2018 to develop a stormwater ditch maintenance plan

ESR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
			channels, while serving as a means of controlling invasive species. ☐ Develop yearly maintenance schedule for all non-jurisdictional ditches.	
ESR-3	Plan out a staged implementation of the shoreline management recommendations described in the *Shoreline Management Plan for AFETA* (2013). Continue with the individual project requirements and design considerations developed in the AFETA Engineering Conditions Survey of Pond and Spillway Structures, Skimino Pond, Powell Lake, Bass Lake, Bigler Mill, and Beaverdam Ponds (Gannett Fleming, 2007).	OPNAVINST 5090.1C	☐ Obtain all required Federal, state and local permits before commencing ground disturbing activities in jurisdictional areas.	Ongoing – a US Waters review is completed on every proposed action to determine the regulatory requirements. *Completed Action: 2016 evaluation of existing shoreline study with new recommendations for 2017 efforts. 2016 completion of dam evaluations by the US Army Corps of Engineers.*
ESR-4	Continue with the activities outlined in the *Forest Management Plan* (2013). As part of this effort, the Natural Resource Manager will perform ground reconnaissance on timber stands, develop a priority treatment recommendation plan, coordinate timber harvesting activities and natural regeneration or planting.	Sikes Act Improvement Act and OPNAVINST 5090.1C	☐ Perform reconnaissance on timber stands. ☐ Prioritize stands for management activities. ☐ Document all land disturbance issues as part of	Ongoing – In 2016, the Natural Resources department began work on updating the forest management plan and to date the inventory cruise is underway. All results and findings are included in this INRMP.

ESR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
			installation forestry management.	
ESR-5	Update the *Forest Management Plan* in concert with subsequent updates to the 2013-2017 INRMP. The Forest Management section of the INRMP should be reconciled against the *Forest Management Plan*. Subsequent updates should include a new forest inventory and updated forest stand mapping.	OPNAVINST 5090.1C	☐ Conduct a forest inventory and update forest stand mapping.	Completed in 2017
ESR-6	Continue to participate in the Deer Management Assistance Program (DMAP) site-specific management program in partnership with the DGIF.	Sikes Act Improvement Act and OPNAVINST 5090.1C	☐ Collect sex, age, weight, and antler development from hunter check stations.	Ongoing
ESR-7	Strive to preserve habitat for cavity-nesting species by maintaining bottomland and upland hardwood areas for wildlife fall and winter habitat, and by providing manmade nesting structures where appropriate.	OPNAVINST 5090.1C	☐ Incorporate activities into a yearly maintenance schedule.	Ongoing – all requirements are evaluated during design and construction phases to preserve habitat.

Table 4.3 Environmental Awareness Recommendations

EAR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
EAR-1	Encourage participation in the Quality Deer Management Program and educate eligible hunters on installation and DGIF deer hunting policies.	Sikes Act Improvement Act and OPNAVINST 5090.1C		Ongoing
EAR-2	Ensure all security and natural resources/environmental staff are informed of points of contact for animal control and rabies testing. All potential rabies exposures should be reported to the Virginia Department of Health, Peninsula Health District.		☐ All potential rabies exposures should be reported to the Virginia Department of Health and	Ongoing – all incidents are properly reported.

EAR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
			maintained in an easily accessible log on the installation.	
EAR-3	Continue EMS development with specific training plans and standard operating procedures for the preservation of natural resources within the installation.	E.O. 13693	☐ Incorporate activities into a yearly maintenance schedule.	Ongoing
EAR-4	Record global positioning system (GPS) locations for all surveyed areas, jurisdictional delineations, forest stands, and other relevant data sets and resources for inclusion in the installation GIS.	Installation Policy		Ongoing
EAR-5	Organize and catalogue existing GIS data into a geodatabase for ease of access and consistency. Organize data into project groups/types to integrate natural resource issues into the planning stages of installation construction and development projects. Develop site specific GIS standards (projection, metadata, etc.) which would be more accurate and useful to the installation.	Installation Policy	☐ Develop site specific GIS standards (projection, metadata, etc.) which would be more accurate and useful to the installation than the broader Spatial Data Standards. ☐ Develop attribute datasheets to ensure consistent and useful data collection. ☐ Organize data into project groups/types to integrate natural resource issues into the planning stages of installation construction and	Ongoing

EAR Number	Description	Primary Legal Driver or Initiative	Action Items	Status of Action Items
			development projects. ☐ Develop a GIS standard operating procedure for inclusion in the installation EMS, to ensure consistent and proper of use of GIS in the planning stages of all projects.	

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Wildlife Management Regulatory Handbook for AFETA Camp Peary, 2015-2016. (2016). Prepared by AFETA Camp Peary, Williamsburg, Virginia.

APPENDIX A – PLAN UPDATES FROM 2017 - 2018

This section is intended to be used for annual updates to this INRMP. This plan covers a five-year period, 2017-2021, but is required to be updated annually, and reviewed and revised a minimum of every five years (United States Department of Defense Instruction 4715.03). Updates and revisions are a necessary part of maintaining a proactive management plan. Ecosystem management is a dynamic process. Therefore, implementation of management goals and objectives is followed by prescribed monitoring to measure management success or failure. The knowledge gained from observation and testing provides the framework on which to base revisions to the plan. This information can be used to document changes to the plan for the benefit of natural resources management. Annual updates will provide information that will be incorporated into the five-year review. All annual updates should be noted in the front of the INRMP, with detailed update information included here in the form of an errata sheet.

DATE	SECTION/PAGE	COMMENTS

APPENDIX B – AGENCY COORDINATION

Solstice Environmental, LLC

127 Peach Street
Cape Charles, Virginia 23310

Phone: 757.408.0023
Fax: 866.783.5282

March 14, 2017

Mr. Albert Spells
U.S. Fish and Wildlife Service
Virginia Fisheries Coordination Office
11110 Kimages Road
Charles City, Virginia 23030

RE: Department of Defense, Armed Forces Experimental Training Activity – Camp Peary
2017 – 2021 Integrated Natural Resources Management Plan 5 Year Update

Dear Mr. Spells:

In 1997, the Sikes Act (16 USC 670 a-f) was amended whereby Department of Defense (DoD) installations shall obtain mutual agreement on their Integrated Natural Resources Management Plan (INRMP) from the U.S. Fish and Wildlife Service and the cognizant State fish and wildlife agency concerning the conservation, protection, and management of fish and wildlife resources. The Sikes Act is the DoD's basic legislation for managing its natural resources.

The Armed Forces Experimental Training Activity – Camp Peary (AFETA Camp Peary) is currently updating their existing Integrated Natural Resources Management Plan for the years 2017 through 2021 to document the condition of natural resources for which they are stewards as well as document basewide natural resource management practices. In an effort to continue the positive relationship that AFETA Camp Peary has with your agency, AFETA Camp Peary is respectfully requesting any information or issues pertaining to natural resources or regulatory compliance that your office would like to see addressed in the updated INRMP document currently being drafted.

Once the Draft INRMP document is available, your agency will be given the opportunity to review and comment on the fish and wildlife components of the plan. To facilitate inter-agency coordination, this request for initial comments has been sent concurrently to the Virginia Department of Game and Inland Fisheries. AFETA Camp Peary is requesting that you respond to me with your initial comments or concerns by April 15, 2017.

Thank you for assisting AFETA Camp Peary with the conservation and management of fish and wildlife resources under their stewardship. If you have any questions regarding this request, please do not hesitate to contact me directly at 757.408.0023 or via email at claudette@solsticeenv.com.

Sincerely,

Claudette L. Twichell

Claudette L. Twichell, Ph.D.
President
Solstice Environmental, LLC

CC: AFETA Camp Peary Environmental Manager File
Robert Duncan, Executive Director; Virginia Department of Game and Inland Fisheries

Solstice Environmental, LLC

127 Peach Street
Cape Charles, Virginia 23310

Phone: 757.408.0023
Fax: 866.783.5282

March 14, 2017

Mr. Robert W. Duncan
Executive Director
Virginia Department of Game and Inland Fisheries
4010 West Broad Street
P.O. Box 11104
Richmond, Virginia 23230

RE: Department of Defense, Armed Forces Experimental Training Activity – Camp Peary
2017 – 2021 Integrated Natural Resources Management Plan 5 Year Update

Dear Mr. Duncan:

In 1997, the Sikes Act (16 USC 670 a-f) was amended whereby Department of Defense (DoD) installations shall obtain mutual agreement on their Integrated Natural Resources Management Plan (INRMP) from the U.S. Fish and Wildlife Service and the cognizant State fish and wildlife agency concerning the conservation, protection, and management of fish and wildlife resources. The Sikes Act is the DoD's basic legislation for managing its natural resources.

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Thank you for assisting AFETA Camp Peary with the conservation and management of fish and wildlife resources under their stewardship. If you have any questions regarding this request, please do not hesitate to contact me directly at 757.408.0023 or via email at claudette@solsticeenv.com.

Sincerely,

Claudette L. Twichell

Claudette L. Twichell, Ph.D.
President
Solstice Environmental, LLC

CC: AFETA Camp Peary Environmental Manager File
Albert Spells; U.S. Fish and Wildlife Service

Subject: RE: Department of Defense, Armed Forces Experimental Training Activity – Camp Peary INRMP 5 Year Update
Date: Wednesday, March 15, 2017 at 9:21:19 AM Eastern Daylight Time
From: Duncan, Bob (DGIF)
To: Claudette Twichell
Attachments: image002.jpg, image003.png

Dr. Twichel,

Thank you for your email regarding the INRMP for AFETA. As you are no doubt already aware, we have a longstanding working relation with AFETA and we look forward to providing comments back to you by the requested date. If you have any questions of us prior to our submission, please don't hesitate to give me a call as I have personally been cooperating with AFETA for more than thirty-five years and hold the personnel and the installation in very high regard.

Best,

Bob

Bob Duncan, Executive Director
Virginia Department of Game and Inland Fisheries
7870 Villa Park Drive, P.O. Box 90778
Henrico, VA 23228-0778
Office 804-367-9231 ~ FAX 804-367-0405

From: Claudette Twichell [mailto:claudette@solsticeenv.com]
Sent: Wednesday, March 15, 2017 8:50 AM
To: Duncan, Bob (DGIF)
Cc: AFETA Environmental Branch
Subject: Department of Defense, Armed Forces Experimental Training Activity – Camp Peary INRMP 5 Year Update

Mr. Duncan:

The Armed Forces Experimental Training Activity – Camp Peary (AFETA Camp Peary) is currently updating their existing Integrated Natural Resources Management Plan for the years 2017 through 2021 to document the condition of natural resources for which they are stewards as well as document basewide natural resource management practices. In an effort to continue the positive relationship that AFETA Camp Peary has with your agency, AFETA Camp Peary is respectfully requesting any information or issues pertaining to natural resources or regulatory compliance that your office would like to see addressed in the updated INRMP document currently being drafted.

Once the Draft INRMP document is available, your agency will be given the opportunity to review and comment on the fish and wildlife components of the plan. To facilitate inter-agency coordination, this request for initial comments has been sent concurrently to the US Fish and Wildlife Service. AFETA Camp Peary is requesting that you respond to me with your initial comments or concerns by April 15, 2017.

Thank you for assisting AFETA Camp Peary with the conservation and management of fish and wildlife resources under their stewardship. If you have any questions regarding this request, please do not hesitate to contact me directly at 757.408.0023 or via email at claudette@solsticeenv.com.
Cheers,
Claudette

Please be advised that Solstice Environmental, LLC has a new mailing address shown below.

Claudette L. Twichell, Ph.D.
President

Solstice Environmental, LLC
127 Peach Street | Cape Charles, Virginia 23310

Office & Mobile Phone: 757.408.0023
Fax: 866.783.5282
Email: claudette@solsticeenv.com
www.solsticeenv.com

Solstice Environmental, LLC is a certified Disadvantaged Enterprise Business (DBE) and Small Woman-owned Business (SWAM).

Please consider the environment before printing this e-mail.

APPENDIX C AFETA Wildlife Inventory

APPENDIX C – Fauna Species Occurring at AFETA				
Status*	***Tier****	***Common Name***	***Scientific Name***	***Confirmed***
FESE		*Turtle, Kemp's (= Atlantic) Ridley sea*	Lepidochelys kempii	
FESE		*Turtle, leatherback sea*	Dermochelys coriacea	
FTST	I	*Turtle, loggerhead sea*	Caretta caretta	
FTST	I	*Plover, piping*	Charadrius melodus	
FTST		*Turtle, green sea*	Chelonia mydas	
SE	II	*Salamander, eastern tiger*	Ambystoma tigrinum tigrinum	
SE	II	*Rattlesnake, canebrake*	Crotalus horridus	
ST	I	*Falcon, peregrine*	Falco peregrinus	Yes
ST	I	*Sandpiper, upland*	Bartramia longicauda	
ST	I	*Shrike, loggerhead*	Lanius ludovicianus	Yes
ST	II	*Salamander, Mabee's*	Ambystoma mabeei	
ST	II	*Treefrog, barking*	Hyla gratiosa	
FSST	II	*Eagle, bald*	Haliaeetus leucocephalus	Yes
ST		*Shrike, migrant loggerhead*	Lanius ludovicianus migrans	
FSCC	II	*Terrapin, northern diamond-backed*	Malaclemys terrapin terrapin	Yes
FS	IV	*fritillary, Diana*	Speyeria diana	
SS	II	*Sturgeon, Atlantic*	Acipenser oxyrinchus	
SS	II	*Heron, little blue*	Egretta caerulea caerulea	Yes
SS	II	*Sparrow, saltmarsh sharp-tailed*	Ammodramus caudacutus	
SS	II	*Tern, least*	Sterna antillarum	
SS	II	*Wren, winter*	Troglodytes troglodytes	Yes
CC	III	*Turtle, spotted*	Clemmys guttata	
SS	III	*Harrier, northern*	Circus cyaneus	Yes
SS	III	*Heron, tricolored*	Egretta tricolor	
SS	III	*Ibis, glossy*	Plegadis falcinellus	
SS	III	*Night-heron, yellow-crowned*	Nyctanassa violacea violacea	Yes
SS	III	*Owl, barn*	Tyto alba pratincola	
SS	III	*Wren, sedge*	Cistothorus platensis	
SS	IV	*Creeper, brown*	Certhia americana	Yes
SS	IV	*Tern, Forster's*	Sterna forsteri	Yes
SS		*Dickcissel*	Spiza americana	
SS		*Egret, great*	Ardea alba egretta	Yes
SS		*Finch, purple*	Carpodacus purpureus	Yes
SS		*Kinglet, golden-crowned*	Regulus satrapa	Yes
SS		*Moorhen, common*	Gallinula chloropus cachinnans	
SS		*Nuthatch, red-breasted*	Sitta canadensis	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
Status*	***Tier****	***Common Name***	***Scientific Name***	***Confirmed***
SS		*Pelican, brown*	Pelecanus occidentalis carolinensis	
SS		*Tern, Caspian*	Sterna caspia	Yes
SS		*Tern, sandwich*	Sterna sandvicensis acuflavidus	
SS		*Thrush, hermit*	Catharus guttatus	Yes
SS		*Warbler, magnolia*	Dendroica magnolia	
SS		*Warbler, mourning*	Oporornis philadelphia	
SS		*Mole, star-nosed*	Condylura cristata parva	
SS		*Otter, northern river*	Lontra canadensis lataxina	
	I	*Rail, black*	Laterallus jamaicensis	
	I	*Sapsucker, yellow-bellied*	Sphyrapicus varius	Yes
	I	*Warbler, black-throated green*	Dendroica virens	
	II	*Bittern, American*	Botaurus lentiginosus	
	II	*Duck, American black*	Anas rubripes	Yes
	II	*Oystercatcher, American*	Haematopus palliatus	
	II	*Rail, king*	Rallus elegans	
	II	*Tern, royal*	Sterna maxima maximus	Yes
	II	*Warbler, cerulean*	Dendroica cerulea	
	III	*Turtle, eastern box*	Terrapene carolina carolina	Yes
	III	*Bittern, least*	Ixobrychus exilis exilis	
	III	*Brant*	Branta bernicla brota	
	III	*Night-heron, black-crowned*	Nycticorax nycticorax hoactii	Yes
	III	*Redhead*	Aythya americana	Yes
	III	*Sparrow, Nelson's sharp-tailed*	Ammodramus nelsoni	
	III	*Tern, common*	Sterna hirundo	
	IV	*Alewife*	Alosa pseudoharengus	
	IV	*Eel, American*	Anguilla rostrata	Yes
	IV	*Shad, American*	Alosa sapidissima	
	IV	*Frog, southern chorus*	Pseudacris nigrita	
	IV	*Salamander, eastern mud*	Pseudotriton montanus montanus	Yes
	IV	*Siren, greater*	Siren lacertina	
	IV	*Spadefoot, eastern*	Scaphiopus holbrookii	
	IV	*Lizard, eastern slender glass*	Ophisaurus attenuatus longicaudus	
	IV	*Ribbonsnake, common*	Thamnophis sauritus sauritus	
	IV	*Scarletsnake, northern*	Cemophora coccinea copei	
	IV	*Slider, yellow-bellied*	Trachemys scripta scripta	
	IV	*Snake, common rainbow*	Farancia erytrogramma erytrogramma	
	IV	*Snake, eastern hog-nosed*	Heterodon platirhinos	
	IV	*Blackbird, rusty*	Euphagus carolinus	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
	IV	*Bobwhite, northern*	Colinus virginianus	Yes
	IV	*Catbird, gray*	Dumetella carolinensis	Yes
	IV	*Chat, yellow-breasted*	Icteria virens virens	Yes
	IV	*Chuck-will's-widow*	Caprimulgus carolinensis	
	IV	*Cuckoo, yellow-billed*	Coccyzus americanus	Yes
	IV	*Dowitcher, short-billed*	Limnodromus griseus	Yes
	IV	*Dunlin*	Calidris alpina hudsonia	Yes
	IV	*Flycatcher, willow*	Empidonax traillii	Yes
	IV	*Godwit, marbled*	Limosa fedoa	
	IV	*Grebe, horned*	Podiceps auritus	Yes
	IV	*Heron, green*	Butorides virescens	Yes
	IV	*Kingbird, eastern*	Tyrannus tyrannus	Yes
	IV	*Knot, red*	Calidris canutus rufus	
	IV	*Meadowlark, eastern*	Sturnella magna	Yes
	IV	*Nuthatch, brown-headed*	Sitta pusilla	Yes
	IV	*Ovenbird*	Seiurus aurocapilla	Yes
	IV	*Parula, northern*	Parula americana	Yes
	IV	*Pewee, eastern wood*	Contopus virens	Yes
	IV	*Rail, clapper*	Rallus longirostris crepitans	Yes
	IV	*Rail, Virginia*	Rallus limicola	Yes
	IV	*Scaup, greater*	Aythya marila	Yes
	IV	*Sparrow, field*	Spizella pusilla	Yes
	IV	*Sparrow, grasshopper*	Ammodramus savannarum pratensis	
	IV	*Sparrow, seaside*	Ammodramus maritimus	Yes
	IV	*Swallow, northern rough-winged*	Stelgidopteryx serripennis	Yes
	IV	*Swift, chimney*	Chaetura pelagica	Yes
	IV	*Tanager, scarlet*	Piranga olivacea	Yes
	IV	*Thrasher, brown*	Toxostoma rufum	Yes
	IV	*Thrush, wood*	Hylocichla mustelina	Yes
	IV	*Towhee, eastern*	Pipilo erythrophthalmus	Yes
	IV	*Vireo, yellow-throated*	Vireo flavifrons	Yes
	IV	*Warbler, black-and-white*	Mniotilta varia	Yes
	IV	*Warbler, blue-winged*	Vermivora pinus	
	IV	*Warbler, Canada*	Wilsonia canadensis	
	IV	*Warbler, Kentucky*	Oporornis formosus	Yes
	IV	*Warbler, prairie*	Dendroica discolor	Yes
	IV	*Warbler, prothonotary*	Protonotaria citrea	Yes
	IV	*Warbler, worm-eating*	Helmitheros vermivorus	

APPENDIX C – Fauna Species Occurring at AFETA				
Status*	***Tier****	***Common Name***	***Scientific Name***	***Confirmed***
	IV	*Warbler, yellow*	Dendroica petechia	Yes
	IV	*Waterthrush, Louisiana*	Seiurus motacilla	Yes
	IV	*Whip-poor-will*	Caprimulgus vociferus	
	IV	*Woodcock, American*	Scolopax minor	Yes
	IV	*Wren, marsh*	Cistothorus palustris	Yes
	IV	*Mouse, cotton*	Peromyscus gossypinus gossypinus	
	IV	*Butterfly, black dash*	Euphyes conspicua	
		Bass, largemouth	Micropterus salmoides	
		Bass, striped	Morone saxatilis	
		Bluegill	Lepomis macrochirus	Yes
		Bullhead, brown	Ameiurus nebulosus	
		Bullhead, flat	Ameiurus platycephalus	
		Bullhead, yellow	Ameiurus natalis	
		Catfish, channel	Ictalurus punctatus	
		Catfish, white	Ameiurus catus	
		Chubsucker, creek	Erimyzon oblongus	
		Crappie, black	Pomoxis nigromaculatus	
		Croaker, Atlantic	Micropogonias undulatus	Yes
		Dace, rosyside	Clinostomus funduloides	
		Darter, tessellated	Etheostoma olmstedi	
		Herring, blueback	Alosa aestivalis	
		Killifish, banded	Fundulus diaphanus	Yes
		Lamprey, sea	Petromyzon marinus	
		Madtom, margined	Noturus insignis	
		Madtom, tadpole	Noturus gyrinus	Yes
		Minnow, eastern silvery	Hybognathus regius	
		Mosquitofish, eastern	Gambusia holbrooki	Yes
		Mudminnow, eastern	Umbra pygmaea	
		Mummichog	Fundulus heteroclitus	Yes
		Perch, pirate	AphreDODerus sayanus sayanus	
		Perch, white	Morone americana	Yes
		Perch, yellow	Perca flavescens	
		Pickerel, chain	Esox niger	
		Pike, northern	Esox lucius	
		Pumpkinseed	Lepomis gibbosus	
		Shad, gizzard	Dorosoma cepedianum	Yes
		Shiner, golden	Notemigonus crysoleucas	
		Shiner, satinfin	Cyprinella analostana	

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Shiner, spottail	Notropis hudsonius	
		Shiner, swallowtail	Notropis procne	
		Spot	Leiostomus xanthurus	Yes
		Stickleback, threespine	Gasterosteus aculeatus	
		Sunfish, redbreast	Lepomis auritus	
		Sunfish, redear	Lepomis microlophus	
		Warmouth	Lepomis gulosus	Yes
		Amphiuma, two-toed	Amphiuma means	
		Bullfrog, American	Lithobates catesbeianus	
		Frog, Brimley's chorus	Pseudacris brimleyi	
		Frog, coastal plain cricket	Acris gryllus gryllus	
		Frog, eastern cricket	Acris crepitans crepitans	Yes
		Frog, northern green	Lithobates clamitans melanota	Yes
		Frog, pickerel	Lithobates palustris	
		Frog, southern leopard	Lithobates sphenocephalus utricularius	
		Frog, upland chorus	Pseudacris feriarum feriarum	Yes
		Newt, red-spotted	Notophthalmus viridescens viridescens	Yes
		Peeper, northern spring	Pseudacris crucifer crucifer	
		Salamander, Atlantic Coast Slimy	Plethodon chlorobryonis	Yes
		Salamander, eastern red-backed	Plethodon cinereus	Yes
		Salamander, four-toed	Hemidactylium scutatum	Yes
		Salamander, marbled	Ambystoma opacum	Yes
		Salamander, northern dusky	Desmognathus fuscus	
		Salamander, northern red	Pseudotriton ruber ruber	
		Salamander, northern two-lined	Eurycea bislineata	
		Salamander, southern dusky	Desmognathus auriculatus	
		Salamander, southern two-lined	Eurycea cirrigera	Yes
		Salamander, spotted	Ambystoma maculatum	
		Salamander, three-lined	Eurycea guttolineata	
		Toad, eastern American	Anaxyrus americanus americanus	Yes
		Toad, eastern narrow-mouthed	Gastrophryne carolinensis	Yes
		Toad, Fowler's	Anaxyrus fowleri	Yes
		Treefrog, Cope's gray	Hyla chrysoscelis	Yes
		Treefrog, green	Hyla cinerea	Yes
		Treefrog, squirrel	Hyla squirella	
		Brownsnake, northern	Storeria dekayi dekayi	Yes
		Cooter, northern red-bellied	Pseudemys rubriventris	
		Copperhead, northern	Agkistrodon contortrix mokasen	

APPENDIX C – Fauna Species Occurring at AFETA				
Status*	***Tier****	***Common Name***	***Scientific Name***	***Confirmed***
		Cornsnake, red	Pantherophis guttatus	
		Cottonmouth, eastern	Agkistrodon piscivorus piscivorus	
		Earthsnake, eastern smooth	Virginia valeriae valeriae	
		Earthsnake, rough	Virginia striatula	
		Gartersnake, eastern	Thamnophis sirtalis sirtalis	
		Greensnake, northern rough	Opheodrys aestivus aestivus	Yes
		Kingsnake, eastern	Lampropeltis getula getula	
		Kingsnake, mole	Lampropeltis calligaster rhombomaculata	
		Lizard, eastern fence	Sceloporus undulatus	
		Milksnake, eastern	Lampropeltis triangulum triangulum	
		Racer, northern black	Coluber constrictor constrictor	Yes
		Racerunner, eastern six-lined	Aspidoscelis sexlineata sexlineata	
		Ratsnake, eastern	Pantherophis alleghaniensis	
		Skink, broad-headed	Plestiodon laticeps	
		Skink, common five-lined	Plestiodon fasciatus	
		Skink, little brown	Scincella lateralis	
		Skink, southeastern five-lined	Plestiodon inexpectatus	
		Slider, red-eared	Trachemys scripta elegans	
		Snake, northern red-bellied	Storeria occipitomaculata occipitomaculata	
		Snake, northern ring-necked	Diadophis punctatus edwardsii	
		Snake, southern ring-necked	Diadophis punctatus punctatus	Yes
		Stinkpot	Sternotherus odoratus	
		Turtle, eastern mud	Kinosternon subrubrum subrubrum	Yes
		Turtle, eastern painted	Chrysemys picta picta	Yes
		Turtle, eastern snapping	Chelydra serpentina serpentina	
		Turtle, striped mud	Kinosternon baurii	
		Watersnake, brown	Nerodia taxispilota	
		Watersnake, northern	Nerodia sipedon sipedon	
		Wormsnake, eastern	Carphophis amoenus amoenus	Yes
		Blackbird, red-winged	Agelaius phoeniceus	Yes
		Bluebird, eastern	Sialia sialis	Yes
		Bufflehead	Bucephala albeola	Yes
		Bunting, indigo	Passerina cyanea	Yes
		Bunting, Lazuli	Passerina amoena	
		Bunting, snow	Plectrophenax nivalis nivalis	Yes
		Canvasback	Aythya valisineria	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Cardinal, northern	Cardinalis cardinalis	Yes
		Chickadee, Carolina	Poecile carolinensis	Yes
		Coot, American	Fulica americana	Yes
		Cormorant, double-crested	Phalacrocorax auritus	Yes
		Cormorant, great	Phalacrocorax carbo	Yes
		Cowbird, brown-headed	Molothrus ater	Yes
		Crossbill, white-winged	Loxia leucoptera	
		Crow, American	Corvus brachyrhynchos	Yes
		Crow, fish	Corvus ossifragus	Yes
		Cuckoo, black-billed	Coccyzus erythropthalmus	Yes
		Dove, mourning	Zenaida macroura carolinensis	Yes
		Dowitcher, long-billed	Limnodromus scolopaceus	
		Duck, long-tailed	Clangula hyemalis	Yes
		Duck, ring-necked	Aythya collaris	Yes
		Duck, ruddy	Oxyura jamaicensis	Yes
		Duck, wood	Aix sponsa	Yes
		Egret, cattle	Bubulcus ibis	
		Egret, snowy	Egretta thula	Yes
		Finch, house	Carpodacus mexicanus	Yes
		Flamingo, greater	Phoenicopterus ruber	Yes
		Flicker, northern	Colaptes auratus	Yes
		Flycatcher, Acadian	Empidonax virescens	Yes
		Flycatcher, great crested	Myiarchus crinitus	Yes
		Gadwall	Anas strepera	Yes
		Gnatcatcher, blue-gray	Polioptila caerulea	Yes
		Goldeneye, common	Bucephala clangula americana	Yes
		Goldfinch, American	Carduelis tristis	Yes
		Goose, Canada	Branta canadensis	Yes
		Goose, greater white-fronted	Anser albifrons flavirostris	Yes
		Goose, lesser snow	Chen caerulescens caerulescens	
		Goose, snow	Chen caerulescens	Yes
		Grackle, boat-tailed	Quiscalus major	Yes
		Grackle, common	Quiscalus quiscula	Yes
		Grebe, pied-billed	Podilymbus podiceps	Yes
		Grebe, red-necked	Podiceps grisegena	
		Grebe, western	Aechmophorus occidentalis	
		Grosbeak, blue	Guiraca caerulea caerulea	Yes
		Grosbeak, evening	Coccothraustes vespertinus	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Gull, Bonaparte's	Larus philadelphia	Yes
		Gull, great black-backed	Larus marinus	Yes
		Gull, herring	Larus argentatus	Yes
		Gull, Iceland	Larus glaucoides	
		Gull, laughing	Larus atricilla	Yes
		Gull, lesser black-backed	Larus fuscus	Yes
		Gull, ring-billed	Larus delawarensis	Yes
		Hawk, broad-winged	Buteo platypterus	
		Hawk, Cooper's	Accipiter cooperii	Yes
		Hawk, red-shouldered	Buteo lineatus lineatus	Yes
		Hawk, red-tailed	Buteo jamaicensis	Yes
		Hawk, rough-legged	Buteo lagopus johannis	
		Hawk, sharp-shinned	Accipiter striatus velox	Yes
		Heron, great blue	Ardea herodias herodias	Yes
		Hummingbird, ruby-throated	Archilochus colubris	Yes
		Ibis, white	Eudocimus albus	
		Jaeger, parasitic	Stercorarius parasiticus	
		Jaeger, pomarine	Stercorarius pomarinus	
		Jay, blue	Cyanocitta cristata	Yes
		Junco, dark-eyed	Junco hyemalis	Yes
		Kestrel, American	Falco sparverius sparverius	Yes
		Killdeer	Charadrius vociferus	Yes
		Kingfisher, belted	Ceryle alcyon	Yes
		Kinglet, ruby-crowned	Regulus calendula	Yes
		Kittiwake, black-legged	Rissa tridactyla	
		Lark, horned	Eremophila alpestris	Yes
		Loon, common	Gavia immer	Yes
		Loon, red-throated	Gavia stellata	Yes
		Mallard	Anas platyrhynchos	Yes
		Martin, purple	Progne subis	Yes
		Merganser, common	Mergus merganser americanus	Yes
		Merganser, hooded	Lophodytes cucullatus	Yes
		Merganser, red-breasted	Mergus serrator serrator	Yes
		Merlin	Falco columbarius	Yes
		Mockingbird, northern	Mimus polyglottos	Yes
		Nighthawk, common	Chordeiles minor	
		Nuthatch, white-breasted	Sitta carolinensis	Yes
		Oriole, Baltimore	Icterus galbula	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Oriole, orchard	Icterus spurius	Yes
		Osprey	Pandion haliaetus carolinensis	Yes
		Owl, barred	Strix varia	Yes
		Owl, great horned	Bubo virginianus	Yes
		Owl, short-eared	Asio flammeus	Yes
		Pelican, American white	Pelecanus erythrorhynchos	Yes
		Phalarope, Wilson's	Phalaropus tricolor	
		Pheasant, ring-necked	Phasianus colchicus	Yes
		Phoebe, eastern	Sayornis phoebe	Yes
		Pigeon, rock	Columba livia	Yes
		Pintail, northern	Anas acuta acuta	Yes
		Pipit, American	Anthus rubescens	Yes
		Redstart, American	Setophaga ruticilla	Yes
		Robin, American	Turdus migratorius	Yes
		Sanderling	Calidris alba	Yes
		Sandpiper, least	Calidris minutilla	Yes
		Sandpiper, spotted	Actitis macularia	Yes
		Sandpiper, western	Calidris mauri	
		Scaup, lesser	Aythya affinis	Yes
		Scoter, black	Melanitta nigra americana	
		Scoter, surf	Melanitta perspicillata	
		Scoter, white-winged	Melanitta fusca deglandi	
		Screech-owl, eastern	Megascops asio	Yes
		Shoveler, northern	Anas clypeata	Yes
		Siskin, pine	Carduelis pinus	Yes
		Snipe, common	Gallinago gallinago	Yes
		Sora	Porzana carolina	
		Sparrow, American tree	Spizella arborea	Yes
		Sparrow, chipping	Spizella passerina	Yes
		Sparrow, fox	Passerella iliaca	Yes
		Sparrow, house	Passer domesticus	Yes
		Sparrow, savannah	Passerculus sandwichensis	Yes
		Sparrow, song	Melospiza melodia	Yes
		Sparrow, swamp	Melospiza georgiana	Yes
		Sparrow, vesper	Pooecetes gramineus	Yes
		Sparrow, white-crowned	Zonotrichia leucophrys	Yes
		Sparrow, white-throated	Zonotrichia albicollis	Yes
		Starling, European	Sturnus vulgaris	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Stork, wood	Mycteria americana	
		Swallow, bank	Riparia riparia	Yes
		Swallow, barn	Hirundo rustica	Yes
		Swallow, tree	Tachycineta bicolor	Yes
		Swan, mute	Cygnus olor	Yes
		Swan, tundra	Cygnus columbianus columbianus	Yes
		Tanager, summer	Piranga rubra	Yes
		Teal, blue-winged	Anas discors orphna	
		Teal, green-winged	Anas crecca carolinensis	Yes
		Titmouse, tufted	Baeolophus bicolor	Yes
		Turkey, wild	Meleagris gallopavo silvestris	Yes
		Turnstone, ruddy	Arenaria interpres morinella	
		Vireo, blue-headed	Vireo solitarius	
		Vireo, red-eyed	Vireo olivaceus	Yes
		Vireo, white-eyed	Vireo griseus	Yes
		Vulture, black	Coragyps atratus	Yes
		Vulture, turkey	Cathartes aura	Yes
		Warbler, black-throated blue	Dendroica caerulescens	
		Warbler, blackpoll	Dendroica striata	
		Warbler, chestnut-sided	Dendroica pensylvanica	
		Warbler, Connecticut	Oporornis agilis	
		Warbler, hooded	Wilsonia citrina	
		Warbler, Nashville	Vermivora ruficapilla	
		Warbler, orange-crowned	Vermivora celata	Yes
		Warbler, palm	Dendroica palmarum	Yes
		Warbler, pine	Dendroica pinus	Yes
		Warbler, yellow-rumped	Dendroica coronata cornata	
		Warbler, yellow-throated	Dendroica dominica	Yes
		Waterthrush, northern	Seiurus noveboracensis	
		Waxwing, cedar	Bombycilla cedrorum	Yes
		Whistling-duck, fulvous	Dendrocygna bicolor	
		Wigeon, American	Anas americana	Yes
		Wigeon, Eurasian	Anas penelope	
		Willet	Catoptrophorus semipalmatus semipalmatus	
		Woodpecker, downy	Picoides pubescens medianus	Yes
		Woodpecker, hairy	Picoides villosus	Yes
		Woodpecker, pileated	Dryocopus pileatus	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Woodpecker, red-bellied	Melanerpes carolinus	Yes
		Woodpecker, red-headed	Melanerpes erythrocephalus	Yes
		Wren, Carolina	Thryothorus ludovicianus	Yes
		Wren, house	Troglodytes aedon	Yes
		Yellowlegs, greater	Tringa melanoleuca	Yes
		Yellowlegs, lesser	Tringa flavipes	Yes
		Yellowthroat, common	Geothlypis trichas	Yes
		Bat, big brown	Eptesicus fuscus fuscus	Yes
		Bat, eastern red	Lasiurus borealis borealis	Yes
		Bat, evening	Nycticeius humeralis humeralis	
		Bat, hoary	Lasiurus cinereus cinereus	
		Bat, little brown	Myotis lucifugus lucifugus	
		Bat, silver-haired	Lasionycteris noctivagans	
		Beaver, American	Castor canadensis	
		Bobcat	Lynx rufus rufus	
		Chipmunk, Fisher's eastern	Tamias striatus fisheri	
		Cottontail, eastern	Sylvilagus floridanus mallurus	
		Coyote	Canis latrans	
		Deer, white-tailed	Odocoileus virginianus	
		Fox, common gray	Urocyon cinereoargenteus cinereoargenteus	
		Fox, red	Vulpes vulpes fulva	
		Mink, common	Mustela vison mink	Yes
		Mole, eastern	Scalopus aquaticus aquaticus	
		Mouse, common white-footed	Peromyscus leucopus leucopus	Yes
		Mouse, eastern harvest	Reithrodontomys humulis virginianus	
		Mouse, house	Mus musculus musculus	
		Mouse, Lewis' golden	Ochrotomys nuttalli nuttalli	
		Mouse, meadow jumping	Zapus hudsonius americanus	
		Muskrat, large-toothed	Ondatra zibethicus macrodon	
		Myotis, northern	Myotis septentrionalis septentrionalis	
		Opossum, Virginia	Didelphis virginiana virginiana	
		Pipistrelle, eastern	Pipistrellus subflavus subflavus	
		Raccoon	Procyon lotor lotor	
		Rat, hispid cotton	Sigmodon hispidus virginianus	
		Rat, marsh rice	Oryzomys palustris palustris	
		Rat, Norway	Rattus norvegicus norvegicus	
		Shrew, Kirtland's short-tailed	Blarina brevicauda kirtlandi	Yes

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Shrew, least	Cryptotis parva parva	
		Shrew, pygmy	Sorex hoyi winnemana	
		Shrew, southeastern	Sorex longirostris longirostris	
		Shrew, southern short-tailed	Blarina carolinensis carolinensis	
		Skunk, striped	Mephitis mephitis nigra	
		Skunk, striped	Mephitis mephitis mephitis	
		Squirrel, eastern gray	Sciurus carolinensis carolinensis	
		Squirrel, southern flying	Glaucomys volans volans	
		Vole, dark meadow	Microtus pennsylvanicus nigrans	
		Vole, pine	Microtus pinetorum scalopsoides	
		Weasel, long-tailed	Mustela frenata noveboracensis	
		Woodchuck	Marmota monax monax	
		Floater, eastern	Pyganodon cataracta	
		Mussel, eastern elliptio	Elliptio complanata	
		Mussel, giant floater	Pyganodon grandis	
		Crayfish	Fallicambarus uhleri	
		CRAYFISH	Fallicambarus fodiens	
		Crayfish, devil	Cambarus diogenes diogenes	
		Crayfish, no common name	Cambarus acuminatus	
		Crayfish, spiny cheek	Orconectes limosus	
		CRAYFISH, WHITE RIVER	Procambarus acutus	
		Armyworm	Pseudaletia unipuncta	
		Borer, European corn	Ostrinia nubilatis	
		Butterfly, Aaron's skipper	Poanes aaroni	
		Butterfly, American lady	Vanessa virginiensis	
		Butterfly, American snout	Libytheana carinenta	
		Butterfly, black swallowtail	Papilio polyxenes asterius	
		Butterfly, Brazilian skipper	Calpodes ethlius	
		Butterfly, broad-winged skipper	Poanes viator	
		Butterfly, cabbage white	Pieris rapae	
		Butterfly, Carolina satyr	Hermeuptychia sosybius	
		Butterfly, carus skipper	Polites carus	
		Butterfly, clouded skipper	Lerema accius	
		Butterfly, clouded sulphur	Colias philodice	
		Butterfly, cloudless sulphur	Phoebis sennae eubule	
		Butterfly, common buckeye	Junonia coenia	
		Butterfly, confused cloudywing	Thorybes confusis	
		Butterfly, coral hairstreak	Satyrium titus	

APPENDIX C – Fauna Species Occurring at AFETA				
*Status**	*Tier***	*Common Name*	*Scientific Name*	*Confirmed*
		Butterfly, crossline skipper	Polites origenes	
		Butterfly, Dun skipper	Euphyes vestris	
		Butterfly, eastern comma	Polygonia comma	
		Butterfly, eastern pine elfin	Callophrys niphon	
		Butterfly, eastern tailed-blue	Everes comyntas	
		Butterfly, eastern tiger swallowtail	Papilio glaucus	
		Butterfly, Edwards' hairstreak	Satyrium edwardsii	
		Butterfly, falcate orangetip	Anthocharis midea	
		Butterfly, fiery skipper	Hylephila phyleus	
		Butterfly, giant swallowtail	Papilio cresphontes	
		Butterfly, great spangled fritillary	Speyeria cybele	
		Butterfly, hackberry emperor	Asterocampa celtis	
		Butterfly, Hayhurst's scallopwing	Staphylus hayhurstii	
		Butterfly, Henry's elfin	Callophrys henrici	
		Butterfly, Horace's duskywing	Erynnis horatius	
		Butterfly, Juvenal's duskywing	Erynnis juvenalis	
		Butterfly, least skipper	Ancyloxypha numitor	
		Butterfly, little wood-satyr	Megisto cymela	
		Butterfly, long-tailed skipper	Urbanus proteus	
		Butterfly, monarch	Danaus plexippus	
		Butterfly, northern broken dash	Wallengrenia egeremet	
		Butterfly, Ocola skipper	Panoquina ocola	
		Butterfly, orange sulphur	Colias eurytheme	
		Butterfly, Palamedes swallowtail	Papilio palamedes	
		Butterfly, pearl crescent	Phyciodes tharos	
		Butterfly, question mark	Polygonia interrogationis	
		Butterfly, red-spotted purple	Limenitis arthemis astyanax	
		Butterfly, sachem	Atalopedes campestris	
		Butterfly, salt marsh skipper	Panoquina panoquin	
		Butterfly, silver-spotted skipper	Epargyreus clarus	
		Butterfly, sleepy duskywing	Erynnis brizo	
		Butterfly, southern broken dash	Wallengrenia otho	
		Butterfly, southern cloudywing	Thorybes bathyllus	
		Butterfly, southern hairstreak	Satyrium favonius	
		Butterfly, spicebush swallowtail	Papilio troilus	
		Butterfly, spring azure	Celastrina ladon	
		Butterfly, tawny emperor	Asterocampa clyton	
		Butterfly, tawny-edged skipper	Polites themistocles	

APPENDIX C – Fauna Species Occurring at AFETA				
Status*	***Tier****	***Common Name***	***Scientific Name***	***Confirmed***
		Butterfly, variegated fritillary	Euptoieta claudia	
		Butterfly, viceroy	Limenitis archippus	
		Butterfly, Zabulon skipper	Poanes zabulon	
		Butterfly, Zarucco duskywing	Erynnis zarucco	
		Butterfly, zebra swallowtail	Eurytides marcellus	
		Earworm, corn	Heliathis zea	
		Gnat	Culicoides stellifer	
		Moth, catalpa sphinx	Ceratomia catalpae	
		Moth, codling	Cydia pomonella	
		Moth, gypsy	Lymantria dispar	
		Tick, American dog	Dermacentor variabilis	
		Tick, brown dog	Rhipicephalus sanguineus	
		Tick, lone star	Amblyomma americanum	
		Tick, rabbit	Haemaphysalis leporispalustris	
		Tick, winter	Dermacentor albipictus	

APPENDIX D AFETA Flora Inventory

Appendix D - Flora Species	*Common Name*
Tree Species	
Acer rubrum	Red maple
Acer saccharinum	Silver maple
Alnus serrulata	Smooth alder
Betula nigra	River birch
Carpinus caroliniana	American hornbeam
Carya aquatica	Water hickory
Carya cordiformis	Bitternut hickory
Carya glabra	Pignut hickory
Carya ovata	Shagbark hickory
Carya tomentosa	Mockernut hickory
Cellis laevigata	Sugarberry
Chionanthus virginicus	Fringetree
Cornus florida	Flowering dogwood
Diospyros virginiana	Persimmon
Fagus grandifolia	American beech
Fraxinus pennsylvanica	Green ash
Ilex opaca	American holly
Juglans nigra	Black walnut
Juniperus virginiana	Eastern red cedar
Liquidambar styraciflua	Sweet gum
Liriodendron tulipifera	Yellow poplar
Magnolia grandiflora	Southern magnolia
Magnolia virginiana	Sweetbay
Nyssa sylvatica	Black gum (tupelo)
Ostrya virginiana	Eastern hophornbeam
Oxydendrum arboreum	Sourwood
Persea borbonia	Redbay
Pinus taeda	Loblolly pine
Platanus occidentalis	American sycamore
Populus deltoides	Eastern cottonwood
Prunus serotina	Wild black cherry
Quercus alba	White oak
Quercus falcata	Southern red oak
Quercus falcala var. pagodifolia	Cherrybark oak
Quercus laurifolia	Laurel oak
Quercus michauxii	Swamp chestnut oak
Quercus nigra	Water oak
Quercus phellos	Willow oak
Quercus rubra	Northern red oak
Quercus virginiana	Live oak
Salix nigra	Black willow
Sassafras albidum	Sassafras
Taxodium distichum	Bald cypress
Ulmus americana	American elm
Ulmus rubra	Slippery elm
Shrubs and Woody Vines	
Ampelopsis arborea	Peppervine
Aralia spinosa	Devil' s walking stick
Ascyrum hypericoides	St. Andrews-cross

Appendix D - Flora Species	*Common Name*
Asimina triloba	Pawpaw
Berchemia scandens	Alabama supplejack
Bignonia capreolata	Crossvine
Callicarpa americana	American beautyberry
Cephalanthus occidentalis	Button- bush
Clethra alnifolia	Sweet pepper-bush
Craetaegus marshallii	Parsley hawthorn
Craetaegus uniflora	One- flower hawthorn
Cyrilla racemiflora	Swamp cyrilla
Gelsemium sempervirens	Yellow jessamine
Hamamelis virginiana	Witch hazel
Ilex cassine	Dahoon
Ilex glabra	Inkberry
Ilex vomitoria	Yaupon
Leucothoe axillaris	Coastal dog hobble
Leucothoe racemosa	Fetter-bush
Lindera benzoin	Spice bush
Lonicera japonica	Japanese honeysuckle
Lyonia lucida	Fetter-bush
Myrica cerifera	Southern wax myrtle
Parthenocissus quinquefolia	Virginia creeper
RhoDODendron serrulatum	Hammocksweet azalea
RhoDODendron viscosum	Swamp azalea
RhoDODendron nudiflorum	Pinxter flower
Rhus copallina	Shining sumac
Rhus glabra	Smooth sumac
Rubus spp.	Dewberries , blackberries , raspberries
Sambucus canadensis	Elderberry
Smilax bona-nox	Saw greenbrier
Smilax glauco	Cat greenbrier
Smilax laurifolia	Laurel-leaf greenbrier
Smilax rotundifolia	Common greenbrier
Smilax smallii	Lanceleaf greenbrier
Symplocos tinctoria	Horse-sugar
Toxicodendron radicans	Poison ivy
Vaccinium angustifolium	Low-bush blueberry
Vaccinium arboreum	Farkleberry
Vaccinium corymbosum	High-bush blueberry
Viburnum acerifolium	Mapleleaf viburnum
Viburnum dentatum	Arrowood viburnum
Viburnum rufidulum	Rusty blackhaw
Vitis aestivalis	Summer grape
Vitis rotundifolia	Muscadine grape
Herbaceous	
Achillea millefolium	Yarrow
Agropyron repens	Quackgrass
Agrostemma githago	Corncockle
Allium canadense	Meadow onion
Allium vineale	Field garlic
Amaranthus retroflexus	Red-root amaranth
Ambrosia artemisiifolia	Common ragweed

Appendix D - Flora Species	*Common Name*
Andropogon glomeratus	Bushy bluestem
Andropogon virginicus	Broomsedge
Anthemis cotula	Mayweed
Apocynum cannabinum	Clasping-leaf dogbane
Arctium minus	Burdock
Arisaema triphyllum	Jack-in-the pulpit
Arundinaria gigantea	Giant cane
Asclepias syriaca	Common milkweed
Asplenium platyneuron	Ebony spleenwort
Athyrium asplenioides	Southern lady fern
Barbarea vulgaris	Yellow rocket
Botrychium dissectum	Common grape fern
Brassica nigra	Black mustard
Campsis radicans	Trumpet creeper
Capsella bursa-pastoris	Sheperd's purse
Carex complanata	Hirsute sedge
Carex lurida	Shallow sedge
Cassia fasciculata	Partridgepea
Cenchrus spp.	Sandbur
Centaurea cyanus	Bachelor’s button
Cerastium vulgatum	Mouse-ear chickweed
Chasmanthium laxa	Slender spike grass
Chenopodium album	White goosefoot
Chrysopsis graminifolia	Grass-leaved goldenaster
Cicuta maculata	Water hemlock
Cirsium arvense	Creeping thistle
Cirsium vulgare	Bull thistle
Coreopsis lanceolata	Lanceleaf tickseed
Crotalaria sagittalis	Weedy rattlebox
Croton capitatus	Wooly croton
Ctenium aromaticum	Toothache grass
Cuscuta spp.	DODder
Cynodon dactylon	Bermuda grass
Cyperus rotundus	Purple flatsedge
Cyperus virens	Green flatsedge
Cypripedium acaule	Pink lady’s slipper
Dactylis glomerata	Orchard grass
Daucus carota	Wild carrot
Dennstaedtia punctilobula	Hay-scented fern
Desmodium ciliara	Littleleaf tick-trefoil
Digitaria sanguinalis	Crab grass
Diodia teres	Buttonweed
Dryopteris intermedia	Evergreen wood fern
Echinochloa crusgalli	Barnyard grass
Eleocharis microcarpa	Small-fruit spikerush
Eleusine indica	Goose grass
Erigeron strigosus	Prairie fleabane
Eryngium yuccifolium	Rattlesnake-master
Eupatorium album	White-bracted eupatorium
Eupatorium capillifolium	Dogfennel
Eupatorium hyssopifolium	Hyssopleaf eupatorium
Eupatorium rotundifolium	Roundleaf eupatorium

Appendix D - Flora Species	*Common Name*
Euphorbia maculata	Spotted broomsedge
Euphorbia supina	Prostrate spurge
Festuca arundinacea	Kentucky 31 tall fescue
Gentiana clausa	Closed gentian
Geranium carolinianum	Carolina cranes-bill
Glecoma hederacea	Ground ivy
Goodyera repens	Rattlesnake plantain
Helenium amarum	Five-leaf sneezeweed
Helianthus angustifolius	Swamp sunflower
Hexastylis arifolia	Little brown jug
Hibiscus moscheutos	Swamp rose mallow
Impatiens capensis	Jewel-weed
Ipomoea hederacea	Ivy-leaved morning glory
Ipomoea purpurea	Common morning glory
Iris virginica	Blue flag
Juncus biflorus	Turnflower rush
Juncus effusus	Soft rush
Juncus scirpoides	Needlepod rush
Juncus tenvis	Slender rush
Lactuca serriola	Prickly lettuce
Lamium amplexicaule	Henbit
Lemna spp.	Duckweed
Lepidium virginicum	Poor-man's peppergrass
Lespedeza striata	Japanese clover
Listera australis	Southern twayblade
Lobelia cardinalis	Cardinal flower
Lobelia puberula	Downy lobelia
Medicago lupulina	Black medic
Mitchella repens	Partridge berry
Mollugo verticillata	Green carpet-weed
Muhlenbergia expanse	Cut-over muhly
Muhlenbergia schraberi	Nimble-will
Onoclea sensibilis	Sensitive fern
Osmunda cinnamomea	Cinnamon fern
Osmunda regalis	Royal fern
Oxalis stricta	Yellow wood sorrel
Panicum aciculare	Narrowleaf panic grass
Panicum anceps	Beaked panic grass
Panicum dichotomiflorum	Fall panic grass
Panicum virgatum	Switchgrass
Paspalum dilatalum	Dallis grass
Paspalum floridanum	Florida paspalum
Phytolacca americana	Pokeweed
Plantago aristata	Bracted plantain
Plantago lanceolata	Buckhorn plaintain
Plantago major	Plaintain
Poa annua	Annual blue grass
Podophyllum peltatum	May-apple
Polygonum aviculare	Knotweed
Polygonum convolvulus	Black bindweed
Polygonum erectum	Erect knotweed
Polygonum pennsylvanicum	Pennsylvania smartweed

Appendix D - Flora Species	*Common Name*
Polygonum persicaria	Lady's thumb
Polypodium polypodioides	Resurrection fern
Polystichum acrostichoides	Christmas fern
Pontederia cordata	Pickerelweed
Portulaca oleracea	Common purslane
Prunella vulgaris	Heal-all
Pteridium aquilinum	Bracken fern
Rhexia mariana	Pale meadow-beauty
Rhexia virginica	Meadow- beauty
Rhynchospora globularis	Globe beakrush
Rhynochosia difformis	Hairy rhynchosia
Rudbeckia hirta	Black-eyed susan
Rumex crispus	Curly dock
Rumex obtussifolius	Bitter dock
Saururus cernuus	Lizard' s tail
Setaria glauca	Yellow bristle grass
Setaria viridis	Green bristle grass
Sida spinosa	Prickly sida
Sisyrinchium angustifolium	Blue-eyed grass
Solanum carolinense	Horse nettle
Solidago odora	Fragrant goldenrod
Sonchus arvensis	Perennial sow thistle
Sorghum halepense	Johnson grass
Sporobolus indicus	Smut grass
Sporobolus junceus	Piney woods dropseed
Stellaria media	Common chickweed
Taraxacum officinale	Dandelion
Thelypteris noveboracensis	New York fern
Thelypteris palustris	Marsh fern
Thlaspi arvense	Field penny-cress
Tipularia discolor	Crane-fly orchid
Trifolium repens	White clover
Typha angustifolia	Narrow-leaved cattail
Vicia sativa	Common vetch
Woodwardia areolata	Netted chain-fern
Woodwardia virginica	Virginia netted chain-fern
Xanthium pennsylvanicum	Cocklebur