



U. S. AIR FORCE
INTEGRATED NATURAL RESOURCES
MANAGEMENT PLAN

JBLE-EUSTIS

January 2024

ABOUT THIS PLAN

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

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language that address USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the USAF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by the approved plan owner. The Joint Base Langley-Eustis (Eustis) [JBLE-Eustis] Integrated Natural Resources Management Plan establishes natural resource management policy and procedures for JBLE-Eustis. Implementation of this plan is directed by the 733 Mission Support Group Commander (as delegated by the 633d Air Base Wing Commander).

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

The Joint Base Langley-Eustis (Eustis) [JBLE-Eustis] Integrated Natural Resources Management Plan (INRMP) establishes natural resource management policy and procedures for JBLE-Eustis. Implementation of this plan is directed by the 733 Mission Support Group Commander (as delegated by the 633d Air Base Wing Commander).

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DOCUMENT CONTROL

Standardized INRMP Template

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

This version of the template is current as of 06/26/2020 and supersedes the 2018 version.

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

Installation INRMP

Record of Review. The INRMP is reviewed no less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. IAW the Sikes Act and AFMAN 32-7003, *Environmental Conservation*, the INRMP is required to be reviewed for operation and effect no less than every five years. An INRMP is considered compliant with the Sikes Act if it has been approved in writing by the appropriate representative from each cooperating agency within the past five years. Approval of a new or revised INRMP is documented by signature on a signature page signed by the Installation Commander (or designee), and a designated representative of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries when applicable (AFMAN 32-7003).

Annual reviews and updates are accomplished by the installation Natural Resources Manager (NRM), and/or a Section Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the Section Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of USFWS, state fish and wildlife agency, and NOAA Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signing the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans. This plan is unclassified and requires no special handling. It may be reproduced in whole or in part as required for the preparation of supporting documents, checklists, briefing aids, etc. The INRMP can be accessed from:

<http://www.jble.af.mil/Units/Army/Eustis-Enviromental/>

INRMP APPROVAL/SIGNATURE PAGES
JBLE - EUSTIS INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
2024-2029

This Integrated Natural Resources Management Plan (INRMP) has been prepared by the Joint Base Langley-Eustis (Eustis) Natural Resources & Integrated Pest Management Team staff in cooperation with the United States Fish and Wildlife Service and the Virginia Department of Wildlife Resources. The signatures below indicate the mutual agreement of the parties concerning the conservation, protection and management of fish and wildlife, and habitat resources as presented in the INRMP to guide natural resources management at JBLE-Eustis from 2024-2029.

PLAN APPROVAL

FRANKIE C. COCHIAOSUE, Colonel, USA
Commander, 733d Mission Support Group*
Joint Base Langley-Eustis (Eustis)

AGENCY AGREEMENT

Cynthia A. Schulz
Fish and Wildlife Administrator
US Fish and Wildlife Service
Gloucester, VA

Ryan Brown
Executive Director
Virginia Department of Wildlife Resources
Richmond, VA

* Approval of the JBLE-Eustis INRMP has been delegated to the 733 MSG Commander per Memorandum, dated 21 Oct 21, SUBJECT: Delegation of Authority for Approval of Integrated Natural Resource Management Plans (INRMP) and INRMP Annual Review Summaries, 21 Oct 21.

EXECUTIVE SUMMARY

Natural resources at JBLE-Eustis consist of game and non-game wildlife, invertebrate fauna, soils, forestry products (mulch, kindling, harvested timber, etc.), land area, and habitats (forests, wetlands, soil (all horizons including humus, topsoil, and subsoil), shoreline/riparian areas, freshwater ponds, tidal and non-tidal creeks, and early successional habitats). A scientific understanding of the complexities associated with these resources is paramount. It is equally critical to understand how natural resources relate to accomplishing the various military missions that take place at JBLE-Eustis.

Mission and natural resources are not segregated terms and they are not independent functions. Natural resources are necessary to meet military missions in the short-term but more importantly, in the long-term. Trees and wildlife have set life spans and cannot be stockpiled. Consider the various interrelationships between military missions and such resources. Healthy forests support outdoor training. Wetlands especially peripheral tidal marshes are required to prevent flooding. Native vegetation holds soil in place and reduces soil erosion. Whitetail deer are important components of the local ecology; however, their management through recreational hunting and management hunts is needed to prevent over-browse of vegetation, reduce vehicular accidents, and reduce tick-borne disease risks. The contributions of native insects are probably the most important aspects of the ecosystems but the least understood. These resources are critical to sustaining military missions to perpetuity both directly and indirectly. Sustainment is not feasible without appropriate management.

The Sikes Act (originally enacted in 1960) facilitated “effectual planning, development, maintenance, and coordination of wildlife, fish, and game conservation and rehabilitation in military reservations.” Its scope was expanded as a comprehensive law mandating the conservation of all natural resources on military lands. In 1997, amendments to the Sikes Act (referred to as the Sikes Act Improvement Act of 1997) enacted interaction between the DoD and Department of the Interior (US Fish & Wildlife Service) and state fish and game agencies. A major provision of the Sikes Act Improvement Act included a mandatory requirement for all DoD installations with natural resources to prepare a comprehensive Integrated Natural Resources Management Plan (INRMP). INRMPs serve as the installation commander’s policy and procedures for natural resources management. INRMPs are prepared with consultation with the US Fish & Wildlife Service and state fish and game agencies (in the case of JBLE-Eustis, this would be the Virginia Department of Wildlife Resources). INRMPs are implemented as 5-year plans upon which a new version is prepared. They are reviewed annually and updated as appropriate.

JBLE-Eustis has prepared and executed INRMPs since 1997. The most recent INRMP was executed June 2019. Since that version expires June 2024, the Natural Resources & Integrated Pest Management Team staff prepared a new version to cover the period of June 2024 through June 2029.

1.0 OVERVIEW AND SCOPE

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

1.1 Purpose and Scope

Purpose

Joint Base Langley-Eustis (Eustis) (JBLE-Eustis) meets the criteria for a Category 1 installation as specified in Section 3.4.1 of AFMAN32-7003 dated 20 April 2020. An INRMP is therefore required. This INRMP establishes natural resources management policy at JBLE-E from 2024 through 2029. It provides goals, objectives and projects to manage natural resources. Natural resources include game wildlife, non-game wildlife, other fauna (such as invertebrate organisms), habitats (surface water [primarily streams/creeks and ponds], tidal and nontidal wetlands, ephemeral pools, forested areas, early successional areas, urban forests, soils, riparian areas, and shorelines), and plants/vegetative communities associated with these habitats, commercial timber/forest products, soils and land area. The INRMP prescribes management of these natural resources in a manner that sustains the availability of said resources to meet continued and future military missions.

The previous JBLE-Eustis INRMP version was approved 6 June 2019 with an expiration of 5 June 2024. Preparation of a new version was initiated in June 2023.

INRMP Support for the Military Mission

JBLE-Eustis became a joint base aligned with LAFB effectively 1 October 2010 as JBLE-Eustis. Natural resources conservation measures and military missions/operations are integrated and consistent with federal stewardship requirements. Natural resource management at JBLE-Eustis generally follows USAF policies and regulations. JBLE-E is a relatively small installation bordered primarily by navigable waters as well as development where federal property abuts City of Newport News property. These conditions constrain JBLE-Eustis as a partially closed ecosystem. Consequently, consistent, and prudent management of its resources is critical to long-term sustainability.

Successful military mission accomplishment is dependent on availability of viable natural resources. Consequently, the habitat types discussed above are critical and management must be effective and efficient. This involves maintaining the complex abiotic and biotic components of these habitats.

Scope

This INRMP establishes natural resources management policy at JBLE-E from 2024 through 2029. The INRMP will be revised in 2029 based on military operations and conditions prevalent at that time.

The INRMP describes the types of natural resources that exist on the installation and prescribes how these resources shall be managed during the 5-year period for which the plan was written. The scope of the INRMP includes management of the following natural resources:

- Wildlife and other fauna. Fauna constitute essentially any animal species. Fauna include game and non-game vertebrate wildlife and other fauna such as invertebrate organisms. All such animals are important towards maintaining biodiversity and a healthy ecosystem. Game represents species that can be harvested as part of recreational hunting programs or those species that could be included in recreational hunting programs once the population reaches a sustainable level that produces excess individuals capable of withstanding harvesting. Whitetail deer represent an important component of recreational hunting as well as a species that must be managed to reduce risks of disease, vehicular collisions, and habitat damage. Non-game wildlife include passerine birds, woodpeckers, ground-nesting birds, reptiles, amphibians and small mammals. Non-game species play complex roles in the installation's ecosystem and are also important to watchable wildlife opportunities. Other fauna include terrestrial and aquatic macroinvertebrates such as insects, spiders, other arthropods, snails, worms, etc.
- Habitats. Several habitat types exist at JBLE-Eustis. These include surface waters [primarily streams/creeks and ponds], groundwater systems, wetlands, ephemeral pools, forested areas, early successional areas, urban forests, soils, riparian corridors, and shorelines. All habitat types support various military training activities, other military operations, aesthetics and quality of life. Each contains unique physical and chemical characteristics as well as vegetative communities. Maintaining these habitats supports their continued use as well as maintaining biodiversity. Habitat management also includes the conservation and protection of floodplains and coastal resources.
- Commercial timber/forest products. JBLE-Eustis contains approximately 2,700 acres of commercial forest land consisting of forest products utilized by the installation community. Commercial forests serve as vital training land for military and other training events and are considered of high value. Forest products cannot be removed, altered, or harvested without federal government compensation, unless deemed of no marketable value or no interested parties for forest product purchases exist. Furthermore, other forest products include firewood and mulch if available. Management involving planned harvesting to balance military needs as well as insect and disease control is a long-term necessity.
- Soils. There are several soil associations on JBLE-Eustis including disturbed soils or urban soils. Management of soils is necessary to reduce the risk of erosion and subsequent

sedimentation releases into surface water systems. Loss from erosion and damage by various activities reduces soil viability for plant growth. This affects availability of usable land, the quality of training areas and degrades aesthetics.

- Land management. Land management activities on JBLE-Eustis involve programs that interface with habitat management and soil management as well as other programs. These activities include invasive vegetation management, other pest management activities, soil erosion control, urban forest management, landscape design, grounds maintenance and water management.

1.2 Management Philosophy

Natural resources are necessary to meet military mission requirements. The various habitat types at JBLE-Eustis provide realistic training facilities to meet current needs and represent opportunities for future needs. These habitats and the organisms that inhabit them also contribute to recreational opportunities for members of the installation community as well as the general public. The INRMP articulates how natural resources are managed to support continued military missions in accordance with respective federal and state laws and regulations, local ordinances, and USAF policies.

The INRMP was developed in an interdisciplinary manner and follows the USAF Principles for Ecosystem Management approach. This approach recognizes the incorporation of JBLE-Eustis missions and community functions into the sustainable use of the several habitat types. This is accomplished by:

- Reducing construction of impervious surfaces.
- Managing invasive and undesirable species to improve the quality of natural areas.
- Convert un-used portions of the installation into native habitats.
- Convert greenspace to habitats containing biologically diverse native plant cover in a manner that provides and sustains natural resources, USAF and USA missions, public health and safety, and outdoor recreation.
- Maintaining hydrological processes of streams, floodplains, and wetlands to the extent practical.
- Implementing long-term wildlife management regimes that maintain wildlife species within the cultural and biological carrying capacity of the installation.
- Incorporate commercial forest management into land sustainability to support the long-term ecosystem health of training areas.
- Include natural resources sustainability consideration in all construction projects and training events.

Integrated Training Area Management

The Integrated Training Area Management (ITAM) program is a core program of the Sustainable Range Program (SRP) and is responsible for maintaining the land to help the Army to meet its training requirements. This requires understanding and balancing Army training requirements and land management practices with close coordination with USAF installation natural resources staff.

The Army's goal in establishing the ITAM program is to achieve optimum, sustainable use of training lands by implementing a standardized methodology for inventorying and monitoring land condition, integrating training requirements with land capacity, educating land users to minimize adverse impacts, and providing for land rehabilitation and maintenance.

The ITAM program was initiated in 1996 as part of the Army's commitment to environmental stewardship. The ITAM Program relies on its four components and the SRP Geographic Information System (GIS) component to accomplish its mission.

The four ITAM components are:

- Training Requirements Integration (TRI).
- Range and Training Land Assessment (RTLA).
- Land Rehabilitation and Maintenance (LRAM).
- Sustainable Range Awareness (SRA).

These components combine to provide the means to understand how the Army's training requirements impact land management practices, what the impact of training is on the land, how to mitigate and repair the impact, and communicate the ITAM message to soldiers and the public. The SRP GIS component is a foundational support element that provides spatial location information that assists land managers in making their decisions.

The ITAM program is staffed by one full-time Government civilian Training Land Management Specialist (ITAM Coordinator), and GIS analyst. Technical support for natural resource planning is obtained from CEIE, CES. Contract support for the conduct of LRAM projects is received from a centrally managed contract. All FY 2018 & 2019 LRAM projects have been included in that contract work statement. GIS support is provided as a separate contract.

Funding for the ITAM program has decreased over the past 3 years. Historically, not all requested and validated projects have been funded. Over the past five years, ITAM projects have supported the Range Operations requirements within the training areas and live fire ranges; correction of maneuver damage, and vegetation management to meet training requirements.

Projects have included the rehabilitation of the training area maneuver corridors (trails), creation of new maneuver trails and special use sites (i.e., convoy reaction course clearings for urban operations site), timber stand improvements, invasive species treatment and monitoring, and the re-vegetation of special use sites using native plants.

Within the next five years training area maneuver trail rehabilitation, training area vegetation management, and the reduction of training related soil erosion will continue to be major focus areas of the ITAM program. Vegetation management will include timber stand improvements including invasive species management, deadfall debris and hazardous tree removal in support of the military training requirements. Projects such as these will continue to be cooperatively planned, conducted, and managed with the CEIE natural resource branch.

Training Land Integration (TRI). TRI is the component of the ITAM Program that provides a decision support procedure to integrate training requirements with land management, training management, and natural and cultural resources management processes and data derived from RTLA and USAF conservation program components. The integration of all requirements occurs through continuous consultation between the ASA and 733 CES (natural and cultural resources managers, and other environmental staff members).

Range and Training Land Assessment (RTLA). RTLA component focuses on sustaining doctrinal training through the acquisition and assessment of data. Typically, RTLA Coordinators inventory and monitor natural resources conditions, and manage and analyze natural resource information. Results are pertinent to management of training and testing lands from training area to installation scales and provides input to decisions that promote sustained and multiple uses on military lands. The RTLA Program evaluates relationships between training land use and condition through the collection of physical and biological resource data. Some range and training land assessments are long term, while others are relatively short. The ITAM program is not funded for a full RTLA program; however, limited data collection and analysis are completed with the in-house ITAM staff.

The RTLA program component tasks that are completed with the in-house staff include:

- Identification of LRAM projects.
- Ensuring that biological considerations are part of the LRAM project prioritization process.
- Determining the effectiveness of LRAM projects.
- Calculating the land condition (i.e. the cover, land use, and load curves).
- Creating maps that depict the availability, suitability, accessibility, and capacity of training lands.
- Conducting internal encroachment assessments.

Land Rehabilitation and Maintenance (LRAM). LRAM component is tasked to repair, sustain, and enhance Army training and testing lands to support realistic training conditions for Soldiers. LRAM implements and maintains the most effective best land management practices for the sustainment of the Army's training and testing mission, directly supporting and benefiting the US Soldier. Much of the JBLE-Eustis ITAM funding is dedicated to the LRAM component.

The LRAM projects focus on erosion control, drainage repair, vegetation control, trail repairs and improvements and training area maintenance and repair. To achieve LRAM objectives, projects are identified and executed to either prevent or solve specific problems.

The LRAM program component tasks that are completed with the ITAM government staff include:

- Identification of project sites that require restoration, rehabilitation, or reconfiguration to improve access to training areas and increase duration of use.
- Identification of land maintenance requirements.
- Development of prioritization lists based on RTLA data, GIS data, input from TRI, and other information available.

- Development of scopes of work for the projects that includes a site description, design, resources required and expected outcome.
- Execution of projects as resources are made available.
- Conducting preventative maintenance and monitoring of completed projects.
- Coordination of long-term land maintenance plans with other real property management programs on the installation.
- Coordination between ASA (ITAM) and 733 CES (CEIE) is required prior to conducting activities.

Sustainable Range Awareness (SRA). SRA component of the ITAM Program provides a proactive means to develop and distribute educational materials to users of range and training land assets. ITAM SRA addresses specific environmental sensitivities at the installation level, to inform land users of restrictions and activities to prevent damage to natural and cultural resources.

The SRA component also includes efforts to inform environmental professionals of Army and installation mission and training activities. Educational SRA tools available include pamphlets/brochures, posters/photos displays, detailed maps and overlays, briefings, and environmental awareness playing cards.

1.3 Authority

The Sikes Act Improvement Act of 1997 (Title 16 of the United States Code Section 670a et seq.) requires military departments to prepare and implement INRMPs at those installations meeting the criteria for such. JBLE-E meets the criteria of a Category I installation which requires an INRMP as articulated in AFMAN 32-7003, (20 April 2020).

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
JBLE I 32-102	Hunting, Fishing, and Boating Programs.
Wildland Fire Management Plan	Wildland Fire Prescription and Response; fuels management.
Integrated Pest Management Plan	Ecosystem-based strategy for pest management and pesticide approval and record keeping.
Integrated Culture Resource Management Plan	Baseline data, management and implementation of culture resource management and preservation.
Notice of Violation and Administrative Action	Table of administrative penalties levied by law enforcement for natural and culture resource violations.

1.4 Integration with Other Plans

Preparation of the INRMP and respective INRMP Annual Review Summaries are staffed within CEIE to ensure no regulatory or management conflict exists. The INRMP is routinely cross-referenced with the Integrated Pest Management Plan (IPMP) and the Wildland Fire Management Plan (WFMP) because all three plans reside within the Natural Resources & IPM Team with several overlapping topics. The Bird Air Strike Hazard (BASH) plan is prepared by 1st Fighter Wing which staffs respective drafts formally through 733 CES.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility (OPR)	The 733 Civil Engineering Squadron, Environmental Element has overall responsibility for implementing the natural resources management program and is the lead organization for monitoring compliance with applicable federal, state, and local regulations.
Natural Resources Manager/Point of Contact (POC)	Name: Adam Priestley. Phone: 757-878-1055. Email: adam.priestley.1@us.af.mil
Federal, State and/or local regulatory POCs (Include agency name for Sikes Act cooperating agencies)	<p>Cindy Schulz Fish and Wildlife Administrator Field Office Supervisor, Virginia Ecological Services Field Office United States Fish and Wildlife Service 6669 Short Lane Gloucester, VA 23061-4410</p> <p>Katherine Ineson Sikes Act Coordinator, United States Fish and Wildlife Service 300 Westgate Center Dr., Hadley, MA 01035 540-553-4337 Katherine_ineson@fws.gov</p> <p>Ryan Brown Executive Director, Virginia Department of Wildlife Resources P.O. Box 90778 Henrico, VA 23228</p> <p>Amy Martin Virginia Department of Wildlife Resources Manager, Nongame and Endangered Species Program 7870 Villa Park Drive Henrico, VA 23228 804-481-5296 Amy.martin@dwr.virginia.gov</p>
Total acreage managed by installation	7,872
Total acreage of wetlands	3,652
Total acreage of forested land	2,652

<p>Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)</p>	<p>Northern Long-eared Bat Biological Opinion and Incidental Take Statement (27 June 2023). https://usaf.dps.mil/b:r/sites/633ABW/733MSG/733CE/Installation%20Management/Environmental/Z-WILDLIFE/PERMITS-REPORTS/BO_Interim%20Consultation%20Framework_SIGNED.pdf?csf=1&web=1&e=OtghIL</p>
<p>Natural Resources Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)</p>	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Fish and Wildlife Management <input checked="" type="checkbox"/> Outdoor Recreation and Access to Natural Resources <input checked="" type="checkbox"/> Conservation Law Enforcement <input checked="" type="checkbox"/> Management of Threatened, Endangered, and Host Nation-Protected Species <input checked="" type="checkbox"/> Water Resource Protection <input checked="" type="checkbox"/> Wetland Protection <input checked="" type="checkbox"/> Grounds Maintenance <input checked="" type="checkbox"/> Forest Management <input checked="" type="checkbox"/> Wildland Fire Management <input type="checkbox"/> Agricultural Outleasing <input checked="" type="checkbox"/> Integrated Pest Management Program <input checked="" type="checkbox"/> Bird/Wildlife Aircraft Strike Hazard (BASH) <input checked="" type="checkbox"/> Coastal Zone and Marine Resources Management <input checked="" type="checkbox"/> Cultural Resources Protection <input checked="" type="checkbox"/> Public Outreach <input checked="" type="checkbox"/> Geographic Information Systems (GIS)

2.1 Installation Overview

2.1.1 Location and Area

JBLE-Eustis is located in the Coastal Virginia region area of Virginia and is bordered by the James and Warwick Rivers approximately 30 miles upstream of the Chesapeake Bay. It is bordered by, and demographically included in, the City of Newport News, located to the east of JBLE-Eustis. A small portion of the installation is adjacent to James City County. JBLE-Eustis is approximately 60 miles Southeast of Richmond and 30 miles northwest of Norfolk.

Acreage and Acquisition. The US Army purchased approximately 8,300 acres of land in 1918 to support US involvement in World War I. The current acreage is estimated closer to 7,872 based on GIS technology. The reduction in acreage may be related to improved technology and erosion of shoreline on Mulberry Island from strong wave action on the James River and storm events. The cantonment area, located in the northwest part of the installation on the mainland of the Virginia Peninsula, contains the highest concentration of land uses, transportation systems, and

infrastructure. Mulberry Island is an adjacent peninsula that is separated from the main installation by a drainageway from the James River to Warwick River.

Installation/GSU Location and Area Descriptions

Installation/ Geographically Separated Unit (GSU)	Main Use/ Mission	Acreage	Addressed in INRMP?	Describe Natural Resource Implications
Main Installation	Administrative, Training; Housing	2,299	Yes	<ul style="list-style-type: none"> • Urban forest, and wetland habitats • Sea level rise and erosion management • Invasive species • Conservation law enforcement • Grounds maintenance • Recreational fishing
Mulberry Island	Training, Weapons ranges, Airfield, ASP, Recreation, Dredge material storage	5,300	Yes	<ul style="list-style-type: none"> • Majority of natural areas, recreational hunting • Commercial forest • Habitat management units • Glideslope intrusion • Bird Air Strike Hazard (BASH) • Invasive species • Sea level rise and erosion management • Conservation Law Enforcement
Training Area 30	Encroachment buffer for Third Port, Maritime Training; Security buffer	64	Yes	<ul style="list-style-type: none"> • Natural area lacking structures or direct use. Not contiguous with installation. • Requires habitat assessment within review period.
Goose Island	Security buffer	49	Yes	<ul style="list-style-type: none"> • Natural area lacking structures or direct use. Not contiguous with installation.

				<ul style="list-style-type: none">• Requires habitat assessment within review period.
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DRAFT

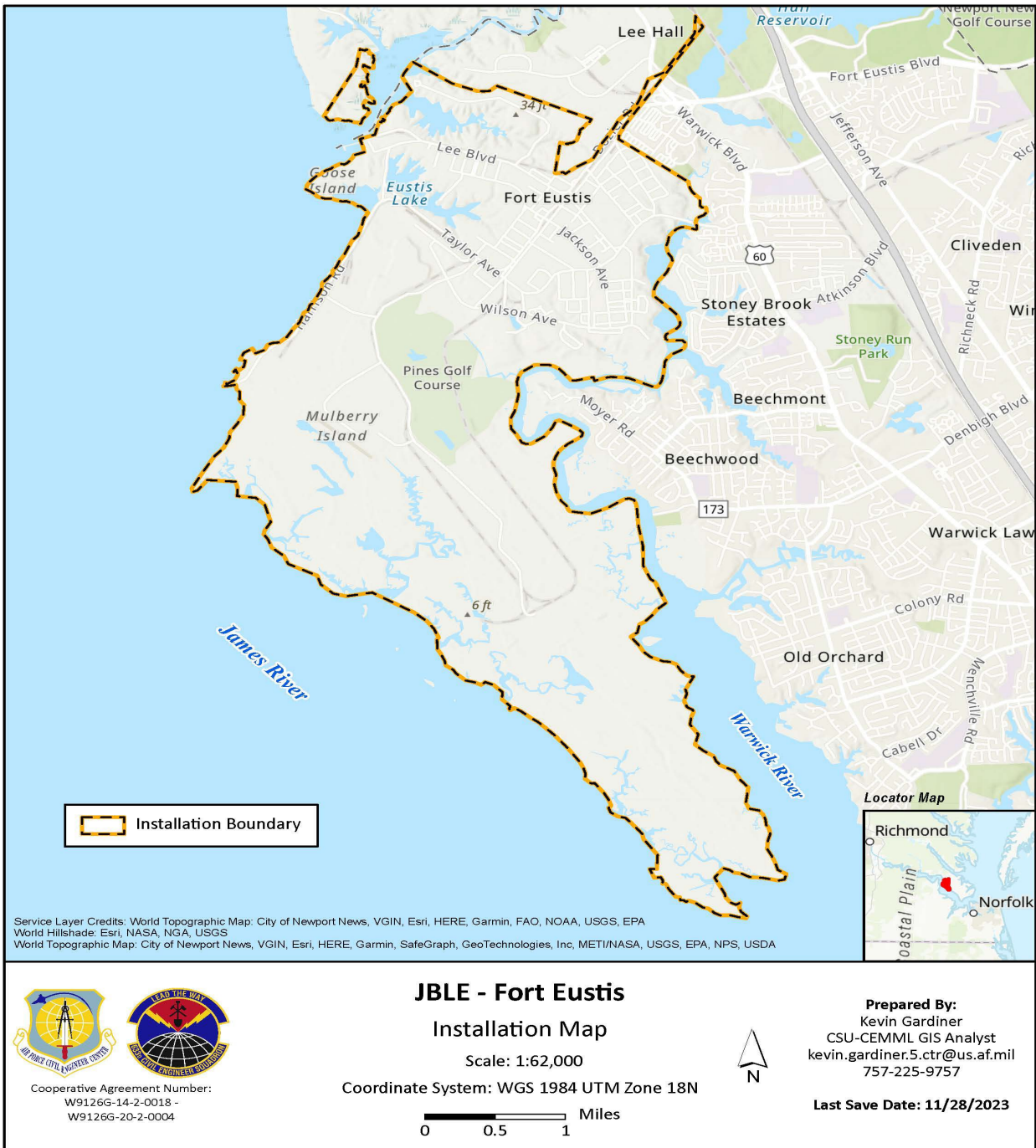


Figure 2-1. Installation Map of JBLE-Eustis

2.1.2 Installation History

JBLE-Eustis is known for its association with Army Transportation, Army Aviation, and as the home to the Army's Training and Doctrine Command. JBLE-Eustis and its predecessor Camp Eustis have a history that includes many branches of the Army. In 1914 the world was thrown into chaos by the start of World War One, the Great War. America entered the war in 1917. By 1918, millions had died, and the war was locked in a deadly stalemate. After a year of combat, Army leaders determined that more and better-trained heavy artillery Soldiers were needed. The task to create a new camp to train Soldiers in heavy artillery fell to the Coast Artillery, headquartered at Fort Monroe, Virginia.

Camp Eustis needed to be within 30 miles of Fort Monroe, easily secured from intruders, have adequate water, railroad facilities, roads, and be of reasonable cost. Mulberry Island was the only location that possessed all of the desired attributes. The peninsula between the Warwick and James Rivers had been named Mulberry Island by English colonists in 1610. The land had been home to Native Americans for thousands of years before the English came and settled here in 1618. Over the three hundred years from 1618 to 1918 Mulberry Island was a microcosm of American history. Native Americans, colonists, indentured servants, enslaved Africans, soldiers from both sides of the Civil War, freed men and women, and their former owners rebuilding after the devastation of the Civil War, all were here and have left their mark on this historic landscape. The most visible remains are the home of colonist Matthew Jones and the twelve field fortifications built for Confederate soldiers mainly by enslaved African-Americans. The traces of all who called Mulberry Island home can be revealed on the two hundred and thirty-four archaeological sites that are on JBLE-Eustis.

On March 19, 1918, the War Department authorized the construction of Camp Eustis for the purpose of concentrating, organizing, equipping, training, and embarking troops for duty abroad as field artillery, railway artillery, trench mortar, and anti-aircraft troops. The camp's namesake MG Abraham Eustis was born in 1786 in Petersburg, Virginia, he proved his valor in the War of 1812 and the Seminole Wars. He commanded the School of Artillery Practice at Fort Monroe from 1824 to 1834.

With the location and name of the new camp determined, construction began. The construction employed over 39,000 men including brick layers, carpenters, electricians, truck drivers, mechanics, and laborers. They were paid between 30 to 85 cents an hour. On 7 June, eighty days, after the order to begin, 100 Soldiers of Battery D, 61st Coast Artillery, arrived and Camp Eustis was open for business.

Approximately 20,000 men were trained at Camp Eustis during the Great War. They were members of Anti-Aircraft Battalions, Ammunition Trains, and a Trench Motor Battalion. Among the many skills these Soldiers learned at Camp Eustis was how to work with observation balloons from the adjacent Lee Hall Balloon School and with airplanes stationed at the nearby and recently opened Langley Airfield.

After the Armistice of 11 November 1918, Camp Eustis was used as a de-mobilization post. It was described by one former Soldier as located far from any village and containing the longest

artillery range in the United States. The artillery pieces covered field upon field. Opposite the ordnance warehouses you could usually see a balloon or two afloat from the balloon school. Many of these hastily created installations closed after the war, but not Camp Eustis. Its combination of location, rail lines, and railroad artillery training facilities continued to be seen as important to national defense. In 1923 Camp Eustis was declared a permanent installation and renamed JBLE-Eustis.

Although founded as a heavy artillery training center, JBLE-Eustis has ties to other branches of the Army. In 1930, the Army created the experimental "Mechanized Force." The Force contained the Army's only active armored-car troop; a company of infantry tanks; a machine-gun company; a self-propelled artillery battery; an engineer company; an ordnance company; and detachments of Signal, Chemical Warfare, and Quartermaster troops. The Mechanized Force experiments failed due to competing interests and suspicion of the new approach. The Great Depression led to the mothballing of JBLE-Eustis. It's the land was transferred to the Federal Relief Agency and the Bureau of Prisons. They operated a camp for homeless laborers and a prison farm. One of the post's historic sites is the cemetery containing the remains of some of the homeless laborers.

In January 1941, JBLE-Eustis was re-activated and became a Coast Artillery Replacement Center. Over 20,000 troops were trained in anti-aircraft artillery during the Second World War. The need to care for the large number of troops led to the creation of a Station Hospital in March of 1941, restarting the practice of caring for Soldiers continued today at the McDonald Army Health Center. The installation was an international training center as troops from the British Army's Caribbean Regiment trained at JBLE-Eustis. As the war was ending in Europe, there was an effort at JBLE-Eustis to De-Nazify POWs. The program gave 26,000 Germans a six-day course in democracy. It was hoped those men could return to Germany and spread democratic ideals at home.

The period after World War II was dominated by the Cold War, and once again JBLE-Eustis evolved. On 10 January 1946, JBLE-Eustis became home to the Transportation Corps and School. To supplement the rail and motor training facilities at JBLE-Eustis, a major port facility was constructed in 1946. The new port facility was named in honor of the Third Port of Embarkation (Mobile) at Oran, Algeria which the Third Transportation Group had operated with great success during WWII. The Transportation Corps evolved as a military body responsible for troop and equipment transportation and played a critical role in opening and maintaining ports of embarkation and debarkation. In 1950, JBLE-Eustis became home to the Transportation Development Engineering Station an organization dedicated to improving the vehicles used by the Transportation Corps. Over the years the organization has changed its focus to aviation. Now, The Aviation Applied Technology Directorate continues to improve the safety and functionality of aircraft used by soldiers around the world.

The Soldiers trained at JBLE-Eustis were vital to moving 3 million Soldiers and over 7 million tons of material during the frigid winters and blazing summers of the Korean Conflict. Helicopters proved their worth in Korea and in December 1954, Felker Heliport opened as the Department of Defense's first airfield dedicated solely to helicopters. The heliport was designed in the form of a giant wheel -- a circular taxiway divided into quarter-sections by two 600-foot runways with eight circular landing pads. Changing missions have led to the heliport being modified into the modern airfield seen today.

The Soldiers trained at the JBLE-Eustis Transportation School played vital roles in the Vietnam War in the air, on the land, and in the water. By the time of the Vietnam War, JBLE-Eustis trained Soldiers in helicopter maintenance, and in port, railroad, and motor vehicle operations. On July 1, 1966, 7th Transportation Brigade was activated at JBLE-Eustis. It is currently one of the Army's most deployed brigades.

Railroad operations and 3rd Port's water operations, to include the underwater operations of the dive detachment, have all played significant roles throughout the history of JBLE-Eustis. Since the first heliport, rotary-wing craft have been an important vehicle in JBLE-Eustis's history, and today, the 128th Aviation Brigade continues that tradition by training Soldiers in all aspects of helicopter maintenance.

The 2005 Base Realignment and Closure Act resulted in the greatest recent change in the make-up of JBLE-Eustis by relocating the Army Transportation School headquarters to Fort Lee in 2010. The Training and Doctrine Command, or TRADOC Headquarters was assigned to JBLE-Eustis in 2011. The BRAC decision consolidated adjoining bases of different services, referred to as joint basing. As a result, JBLE-Eustis and Langley Air Force Base were aligned under the responsibility of the USAF and the 633d Air Base Wing as Joint Base Langley-Eustis (JBLE) effective 1 October in 2010.

Withstanding significant changes in mission and purpose in its first 100 years, JBLE-Eustis has proven to be a vital source of military power and an enduring military installation in the Hampton Roads community. JBLE-Eustis continues to evolve and be an integral part of our national defense, impacting the future not just of the surrounding community, but the entire world.

2.1.3 Military Missions

Training activities at JBLE-Eustis are primarily performed by the 128th Aviation Brigade, 7th Transportation Brigade (Expeditionary), remaining US Army Transportation School components (Port operations, watercraft and rail operations tasks), 80th Training Command and units assigned to the US Army Reserve Center (USARC). Additionally, some external DoD organizations, other federal agencies, and USA Reserve Officer Training Corps (ROTC) students train periodically at JBLE-Eustis.

128th Aviation Brigade provides training to the Soldiers within Career Management Areas (CMF) 15 (Aviation) for aviation maintenance and logistics. It conducts Initial Entry Training, NCOES and AIT for reclassification under CMF 15 (CMF 15 is associated aviation logistics-related missions and tasks) and NCOES for within the Aviation Logistics area. Training exercises in support of the US Army's Warrior Ethos are culminating events for IET and AIT Soldiers attending aviation logistics Military Occupational Skills (MOS) producing course. These exercises concentrate on course instruction previously taught and mandatory Warrior Battle Tasks. Operational training is conducted by both tenant unit (those US Army Active Army and Reserve Component units stationed on JBLE-Eustis) and by non-tenant units (those US Army Active and Reserve Component, and other DoD units not physically located on JBLE-Eustis).

The 7th Transportation Brigade (Expeditionary) is a US Army Force Command (FORSCOM) organization located at JBLE-Eustis as a tenant organization. The Brigade's mission is to prepare and train for fixed port operations and logistics-over-the-shore (LOTS) in support of national policy; to conduct limited highway and motor transport operations; to support domestic emergency plans as required; to support the requirements of the installation, USATSCH, and the 128th Aviation Brigade; and to support annual training of Reserve Component units.

US Army Reserve Component (USARC) units throughout all branches as well as of the DoD Services conduct training at JBLE-Eustis. USARC Transportation Total Army Schools System Battalions conduct MOS Initial Entry Training (IET) and Advanced Individual Training (AIT) training within the areas of cargo handling, cargo documentation, rail, and watercraft. USARC operational units conduct Mission Essential Training List (METL), operations and exercises to include Surface Training and Rail Training. Further through the USARC deployment certification and recertification courses are conducted in conjunction with the USATSCH for 88H units and personnel.

Drills involve field training exercises conducted over multiple days to include aviation logistics, convoy training, urban operations, and live fire operations.

The mission of the 733d Mission Support Group (MSG) is to provide the installation capabilities and services to support expeditionary operations in a time of persistent conflict, optimizes resources and sustains the environment, and provides a quality of life for Soldiers and Families commensurate with their service while transforming to JBLE. Essentially this includes compliance with environmental laws and regulations and management of natural resources throughout the installation.

As a joint base, under the management of the USAF, JBLE-Eustis retains many US Army missions including training support. Army Support Activity (ASA) has several missions to include training support functions such as Range Operations and Integrated Training Area Management (ITAM). JBLE-Eustis consists of several weapons ranges and training areas that contain natural resources, so it is pertinent to identify these areas. Section 2.4.2 and Tables 2-6 and 2-7 provide a description of weapons ranges and training areas.

Additionally, 1st Fighter Wing (1FW) manages Felker Army Airfield (FAAF). Military aircraft flight training and other related activities occur at the airfield. FAAF operates the Sling Load & Landing Zone (STALZ) training area located in Training Area 28. JBLE-Eustis maintains a port facility (Third Port) which is used primarily by the Maritime and Intermodal Training Department (Maritime Training Division and Cargo Handling Division (CHD) of the US Army Transportation School (USATSCH) and 7th Transportation Brigade (Expeditionary). Third Port is managed by the Harbormaster within the 733 Logistics Readiness Squadron (733 LRS).

Effective at the time of this INRMP JBLE-Eustis comprised the following supported Commands:

Listing of Tenants and Natural Resources Responsibility

Tenant Organization	Natural Resources Responsibility
TRADOC: <ul style="list-style-type: none"> • HQ TRADOC • TRADOC Band • 128th Aviation Brigade • U.S. Army Training Support Center (ATSC) 	Coordinate training/operations in Training Areas with natural resources staff. Request urban wildlife conflict support from 733 CES. Comply with INRMP.
U.S. Army Forces Command (FORSCOM): <ul style="list-style-type: none"> • 7th Transportation Brigade (Expeditionary) 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
US Army Transportation School (USATSCH): <ul style="list-style-type: none"> • Maritime and Intermodal Training Department (Maritime Training Division and Cargo Handling Division (CHD)) 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
Army Materiel Command (AMC): <ul style="list-style-type: none"> • US Army Aviation Applied Technology Directorate (AATD) • 597th Transportation Brigade 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
U.S. Joint Forces Command: <ul style="list-style-type: none"> • Joint Deployment Training Center 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
U.S. Northern Command: <ul style="list-style-type: none"> • Joint Task Force Civil Support 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
NETCOM: <ul style="list-style-type: none"> • 93D Signal Brigade 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
U.S. Army Medical Command (MEDDAC): <ul style="list-style-type: none"> • McDonald Army Health Center • Mid-Atlantic Veterinary Command 	Coordinate tick & mosquito data and zoonotic disease incidents with 733 CES. Request urban wildlife conflict support from 733 CES related to zoonotic diseases. Comply with INRMP.
U.S. Army Reserve (99th RRC): <ul style="list-style-type: none"> • Army Reserve Center • Aviation Support Facility 92 • Equipment Concentration Site 93 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
USAF: <ul style="list-style-type: none"> • Det 1, 360th Training Squadron 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
U.S. Coast Guard: <ul style="list-style-type: none"> • Port Security Unit 305 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.
U.S. Department of Transportation: <ul style="list-style-type: none"> • National Defense Reserve Fleet 	Request urban wildlife conflict support from 733 CES. Comply with INRMP.

2.1.4 Natural Resources Needed to Support the Military Mission

Natural resources are required to perpetuate the military training mission and must include habitat types to support different mission requirements. Healthy and managed forests replicate Eastern European ecosystems and other temperate environments both north and south of the equator. Such habitat types provide conditions for cover and concealment for soldiers/opposing forces conducting tactical training and land navigation. Commercial forests and early successional habitat (grass and herbaceous) provide diverse and realistic training areas that replicate vegetation types encountered across the world. Forested areas can also serve as buffers/dividing points for land areas involving different uses. Wetland areas can function as natural areas for certain dismounted training and barriers to opposing forces in training events. Furthermore, retention of wetland habitats especially marsh habitats are critical to mitigate the effects of flooding from storm events so that training can resume in a timely manner. Shoreline areas are needed to perform Joint Logistics Over the Shore (JLOTS)/Logistics Over the Shore (LOTS), modular floating causeway pier operations, and other water-to-land training.

2.1.5 Surrounding Communities

JBLE-Eustis is adjacent to the independent City of Newport News primarily on the northern boundary. The northern boundary includes Training Areas 1 and 2 as well as the Tactical Equipment Maintenance Facility which is adjacent to the Oakland Industrial Park. The main gate entrance and other portions are adjacent to private land. The installation is separated from the Newport News on the eastern boundary by the Warwick River. Residential areas primarily exist along the Newport News side of the river. The width of the Warwick River is variable but only several hundred feet at the widest point. The James River is considerably wider and borders JBLE-Eustis on the western side. A parcel of land referred to as Training Area 30 and Goose Island are the only non-contiguous component of JBLE-Eustis. Training Area 30 exists on the western side of Skiffes Creek (across from Third Port) and is adjacent to James City County. Goose Island is a parcel immediately south of Third Port and is separated from the installation by narrow stream and a cove.

Overall, the natural and man-made features described above preclude any expansion by the installation. These features also create the condition of a partially closed ecosystem. Some wildlife populations are restricted to the installation while others have limited mobility.

2.1.6 Local and Regional Natural Areas

The Virginia Peninsula on which JBLE-Eustis exists includes the Cities of Newport News, Hampton, and Poquoson as well as York County. Much of these municipalities comprise disturbed urban and suburban areas. Industry and businesses exist throughout the Peninsula. Some agriculture exists but to a lesser extent.

There are two parks located within approximately 5 miles of JBLE-Eustis containing similar natural resources found on the installation. These include Newport News Park and the Colonial National Historic Park.

Newport News Park is one of the largest municipal parks in the eastern United States. It contains approximately 8,300 acres of pine-mixed hardwood forests, swamps, marshes, two large reservoirs and several ponds. The park is located both within York County and the City of Newport News. It is primarily used for outdoor recreational activities including hiking, camping, golfing, boating, biking, fishing, and bird watching as well as other wildlife viewing.

The Colonial National Historic Park is administered by the National Park Service. Cumulatively, the property consists of approximately 8,600 acres within the boundaries of York and James City Counties, Gloucester, Surry, and the City of Williamsburg. It contains mixed hardwood-pine forests, open fields, early successional habitats, and wetlands. Some portions are not open to the public while the Yorktown Battlefield contains roads and trails for viewing historical landmarks as well as hiking, cycling and jogging.

Several public boat launch sites (both freshwater and saltwater) exist in the local area and proximity to JBLE-Eustis. These include (but not limited to):

- Denbigh Park (located at the end of Denbigh Boulevard, provides access to the Warwick River).
- Peterson’s Yacht Basin (located at 16th Street and Walnut Avenue, provides access to the Hampton Harbor).
- Huntington Park Boat Ramp (located near the entrance to the James River Bridge on Mercury Boulevard, provides access to the James River).
- Menchville Public Marina.
- Newport News Park – Lee Hall Reservoir.
- Newport News Park – Harwood’s Mill Reservoir.

2.2 Physical Environment

2.2.1 Climate

Moderate winters, pleasant spring and fall seasons, and long, warm summers characterize the climate of JBLE-Eustis. Intermittent cold periods are not uncommon due to easterly winds from the Atlantic Ocean. JBLE-Eustis is located south of the typical path taken by the principal storms generated in the higher latitudes. It is located north of the track commonly taken by the tropical storms and hurricanes generated in the lower latitudes. Climate projections for JBLE-Eustis ((Table 1) suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these two climate change scenarios on the site’s natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030 and extracted data from 2046 to 2055 for the decadal average for 2050.

For the decade centered around 2030, both scenarios project a similar degree of increase in average annual temperature (TAVE) of between 2.2 °F (1.2 °C) and 2.6 °F (1.4 °C) over the historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5

expressing a warming of 3.0 °F (1.7 °C). RCP 8.5 expresses a slightly greater warming of 3.8 °F (2.1 °C) for this period.

Average annual precipitation (PRECIP) varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, RCP 4.5 scenario remains relatively unchanged while RCP 8.5 shows an increase of 5%. For 2050, RCP 4.5 and RCP 8.5 both project a moderate increase in PRECIP of 12% over historic average.

Table 2-1. Summary climate data.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	45.6	45.5	51.0	47.8	51.1
TMIN (°F)	50.2	52.3	53.2	52.6	53.8
TMAX (°F)	69.6	71.8	72.7	72.4	73.5
TAVE (°F)	59.9	62.1	62.9	62.5	63.7
GDD (°F)	5010	5526	5734	5591	5894
HOTDAYS	31.8	48.9	61.2	59.1	67.2
WETDAYS	0.7	0.4	0.6	0.8	1.6

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

Understanding changes in daily intensity and total precipitation for multi-day precipitation events is helpful to evaluate precipitation patterns in addition to assessment of annual averages. Three-day storm events (design storms) were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes (Table 2). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison.

Table 2-2. **Design storm precipitation.**

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	1.2	1.0	1.0	1.6	1.5
	Day 2	1.9	2.0	2.3	2.4	2.3
	Day 3	1.0	1.0	0.9	1.3	1.4
	Total	4.1	4.0	4.2	5.3	5.2
Percent change from baseline			-2%	3%	31%	30%

2.2.2 Landforms

JBLE-Eustis is an island of biodiversity in a landscape of heavily developed land in Hampton Roads. The Virginia Peninsula is a landmass of 400 square miles and extends from a location 40 miles east of Richmond to the confluence of the James River and Chesapeake Bay. Nearby tracts of limited undeveloped land include Newport News Park, Colonial National Historic Park and Naval Weapons Station Yorktown. JBLE-Eustis contains a chain of islands along the James River shoreline that are separated from Mulberry Island by tidal marshes. It is partially isolated ecologically by natural barriers such as the James and Warwick Rivers and physical barriers along its northern boundary such as development of fences.

Topography

JBLE-Eustis is located in the Atlantic Coastal Plain Physiographic Province. The terrain is low and flat, rising from approximately 5 feet above mean sea level (MSL) on Mulberry Island to approximately 30 feet above MSL in the cantonment area (USATCFE 1997). The elevation of the 100-year floodplain is 8.3 feet above MSL at JBLE-Eustis. Mulberry Island lies below the 100-year floodplain. The general topography of the Virginia peninsula is characterized by a succession of plains separated by a series of scarps (Montgomery Watson 1997). The intervening scarps have a relatively sharp slope in comparison to the plains and face either east, or north towards the Warwick River, or south towards the James River.

2.2.3 Geology and Soils

Geology. JBLE-Eustis lies on the Pleistocene-aged (10,000 to 1.6 million years ago) Princess Anne terrace formation. Approximately 2,000 feet of unconsolidated Cretaceous (66 to 144 million years ago) and Tertiary (28 to 66 million years ago) period sediments separated by an unconformity lie between the terrace and the granite basement rock. These deposits consisting of clay, silt, sand, and gravel with variable amounts of shell material thicken and drop eastward toward the Atlantic Ocean. Virginia is relatively active seismically, but earthquakes are rarely strong. Since records have been kept, no earthquakes have been centered in the JBLE-Eustis area. The installation is located in Earthquake Hazard Zone 2, which means there is moderate probability for damage should an earthquake occur.

Soils. There are seven soil associations on JBLE-Eustis in addition to disturbed or urban soils. The soil associations include two general groups: (1) low river terrace and marsh soils and (2) low coastal plain upland soils.

Soils in the Low River Terraces and Marshes associations were formed in alluvium along the James and Warwick rivers and their tributaries. Soils in these associations range from well to very poorly drained with subsoil and substrata textures that range from sandy to clayey. The soils are gently sloped or level and are prone to flooding. These associations account for 75 percent of the soil associations.

Soils on the Low Coastal Plain Uplands were formed in fluviomarine sediments of the lower. Soils range from well to poorly drained with subsoil textures that range from loamy to clayey. These associations are deep, nearly level to steep sloping, and are not subject to flooding. They support woodlands and account for 22 percent of the soil associations.

The Urban and Disturbed Lands association contains soils that have been used at building sites. The soils are difficult to reclaim, and on-site investigations are necessary to determine the potential of the area for any use. They comprise about 3 percent of the surveyed area.

2.2.4 Hydrology

Groundwater

The hydrogeologic framework in the JBLE-Eustis area consists of a system of seven aquifers separated by intervening semi-confining units. The Columbia, Yorktown-Eastover, Chickahominy-Piney Point and Aquia aquifers and the intervening units comprise roughly the upper one-quarter of the total thickness of the coastal plain sediments on JBLE-Eustis. The remaining sediment thickness consists of the upper, middle, and lower aquifers and the intervening units that comprise the Potomac Group. Groundwater flow is in a southeasterly direction.

The Columbia Aquifer attains a maximum thickness of 35 feet, but the aquifer is between 10 and 15 feet thick on JBLE-Eustis. Groundwater moves under the influence of gravity to discharge along streams, rivers, and lakes. Recharge occurs primarily as infiltration of precipitation. The upper portion of the Columbia Aquifer comprises the water table (Meng and Harsh 1988). The Yorktown unit separates the Columbia Aquifer from the underlying Yorktown-Eastover Aquifer. The Yorktown unit occurs at approximately 30 to 40 feet below the ground surface near Eustis Lake and is about 30 feet thick. The top of the Yorktown-Eastover Aquifer is approximately 40 feet below the ground surface. The thickness of the aquifer ranges from 100 to 200 feet on JBLE-Eustis. The Chickahominy-Piney Point Aquifer ranges in thickness from 50 to 100 feet. The average thickness of the Aquia Aquifer is 100 feet or more. The Aquia Aquifer is capable of supplying large quantities of water that is suitable for most uses, and the aquifer serves as a water source for many light industrial, small municipal, and domestic users on the Virginia Peninsula. The Potomac group includes the six lowermost hydrogeologic units of the Virginia Coastal Plain and consists of three aquifers and three confining units (Meng and Harsh 1988).

Potable water is supplied to JBLE-Eustis by the City of Newport News Lee Hall Water Filtration Plant, approximately one mile from the installation. Three deep wells in the cantonment area are the primary sources of non-potable water; two served the former sand pool (now closed) and the third is located adjacent to B401. The sand pool wells are out of service but not capped. The B401 well is still in service but rarely used.

Surface Water and Shoreline

JBLE-Eustis has an estimated 21.6 miles of open tidal shoreline along the James River, Warwick River, and Skiffes Creek. In addition, there are several miles of shoreline within installation boundaries along small tidal creeks. The natural forces of waves and currents erode the open, tidal shorelines of the installation.

The named waterways on or bordering JBLE-Eustis are Bailey Creek, Skiffes Creek, Milstead Creek, Island Creek, Butlers Gut, Blows Creek, Morrisons Creek, Fort Creek, Nellis Creek and Jail Creek. Bailey Creek is located on the northern boundary of JBLE-Eustis and is a tidally influenced tributary of Skiffes Creek. It flows in a westerly direction through a low wetlands area and empties into Skiffes Creek, which flows into the James River. Milstead Creek, Island Creek, and Butlers Gut connect the James and Warwick rivers. A canal connected the creeks early this century to create a thoroughfare between the rivers. Jail Creek drains the southern tip of Mulberry Island and discharges to the James River at its confluence with the Warwick River. Morrisons Creek, Blows Creek, and Fort Creek drain the western portion of Mulberry Island and discharge to the James River. There are several unnamed tributaries as well as six golf course ponds. The Warwick River defines the eastern boundary of the installation and flows southward into the James River ([Figure 2-2](#)).

Eustis Lake and Browns Lake are two man-made lakes on JBLE-Eustis (as well as Memorial Pond). These are the only freshwater surface waters in cantonment. Both are environmental restoration program (ERP) sites that have land use controls. Eustis Lake is a 45-acre man-made recreational impoundment in the northwestern portion of the installation. The impoundment has an average depth of 4 feet, a maximum depth of 8 feet, and 38,000 feet of mostly wooded shoreline. The water level is maintained primarily by directed stormwater conveyances, overland flow, and, to a lesser degree, by groundwater. The contributing drainage area is 0.91 square miles. Installation personnel use the lake for boating (no outboard motors) and catch-and-release fishing; however, swimming and wading are prohibited. There is a nature trail that extends around the upper portion of the lake. Browns Lake is a 2.5-acre scenic pond in the southern part of the cantonment area. It was constructed in the 1950s as a stormwater retention pond to prevent contaminant release to the Warwick River. Browns Lake has a maximum water depth of 11 feet. Stormwater from vehicle maintenance facilities and a locomotive shop north of Browns Lake discharges to a stream that leads directly to the lake. Surface water discharges from Browns Lake into a natural drainage way, which eventually flows to the Warwick River. Browns Lake also offers fishing but is also restricted to catch-and-release. Boating, wading, and swimming is prohibited in Browns Lake. A small man-made pond (Memorial Pond) exists along Victory Boulevard immediately south of Third Port.

Stream Channel Modeling

Modeling of stream channel overflow (or flood modeling) was not conducted for JBLE-Eustis because Lee Hall Reservoir has a controlling impact on storm water runoff and discharge upstream of the installation. The scope of flood modeling was limited to stream channel networks and did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts).

Coastal Zone Modeling

Exposure to sea level rise (SLR) and storm surges (SS) was assessed using a Department of Defense (DoD) site specific scenario database. Details on the development and use of this database are described in Hall et al. (2016). Extreme water level scenarios were based on regional frequency analysis estimates of 20-year and 100-year storm surges. Coastal flooding projections were modeled for RCP 4.5 and RCP 8.5 emission scenarios in 2035 and 2065 in accordance with the DoD scenario database. SLR inundation estimates the new permanent coastline for each scenario and timeframe. SS inundation estimates short term flooding associated with an extreme water level event that is expected to recede after the storm.

Table 3 summarizes projected coastal inundation in acres for each scenario. SLR is projected to reduce installation area by between 21.2% (RCP 4.5 in 2035) and 33.3% (RCP 8.5 in 2065). The spatial extent of projected flooding due to SLR and SS is depicted in a series of maps included in Appendix C. SLR impacts are expected to be concentrated on the southwestern shoreline and along the Warwick River. Existing riparian and wetland areas are the most vulnerable to SLR inundation.

Projections for a 20-year SS, which have a 5% probability of occurring any given year, estimate possible inundation of between 5114 acres (64.8% of the installation area) for the RCP 4.5 scenario in 2035 to 5552.8 acres (70.3% of the installation area) for the RCP 8.5 scenario in 2065. Projections for a 100-year SS, which have a 1% probability of occurring any given year, estimate possible inundation up to 5692.8 acres (72.1% of the installation area) for the RCP 8.5 scenario in 2065.

Table 2-3. Projected SLR and SS inundation at JBLE-JBLE-Eustis.

Climate Scenario		2035		2065	
		Projected inundation (acres)	Percent of installation area inundated	Projected inundation (acres)	Percent of installation area inundated
RCP 4.5	SLR	1674.9	21.2%	2221.2	28.1%
	20-yr SS	5114.3	64.8%	5411.1	68.5%
	100-yr SS	5419.2	68.6%	5609.1	71.0%
RCP 8.5	SLR	2057.5	26.1%	2626.4	33.3%

	20-yr SS	5319.2	67.4%	5552.8	70.3%
	100-yr SS	5558.8	70.4%	5692.8	72.1%

DRAFT

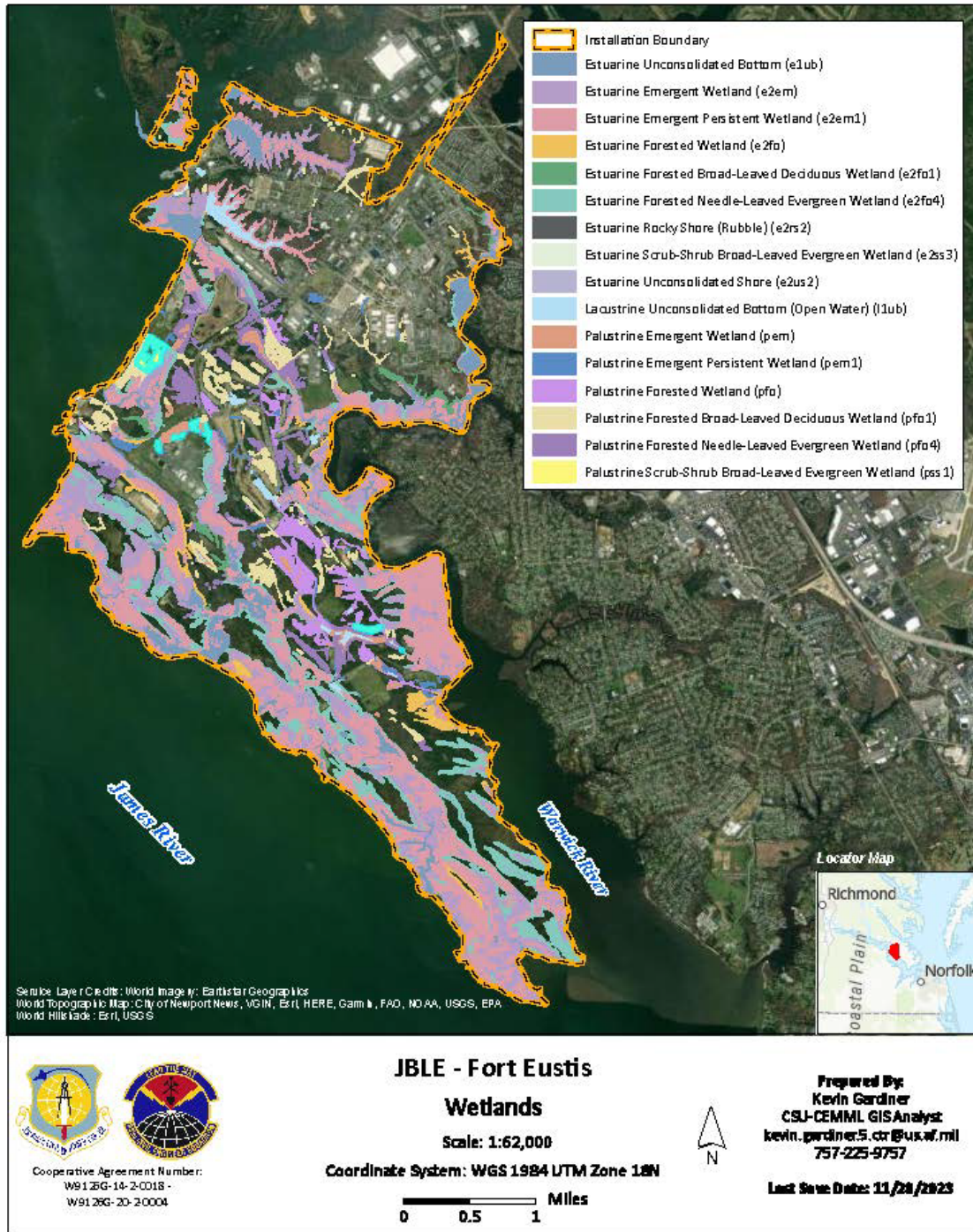


Figure 2-2. Wetlands & Surface Waters at JBLE-Eustis

2.3 *Ecosystems and the Biotic Environment*

2.3.1 *Ecosystem Classification*

JBLE-Eustis as an ecosystem can be classified based on the National Hierarchical Framework of Ecological Units (based on Ecoregions of the United States, U.S. Forest Service, U.S. Department of Agriculture, 2014):

- Domain: Humid Temperate.
- Division: Subtropical.
- Province: Outer Coastal Plain Mixed Forest.
- Section: Middle Atlantic Coastal Plain.

The Middle Atlantic Coastal Plain can be described as follows (Bailey, 2014). Topography is generally flat with elevations ranging up to 80 feet. The soil types are generally poorly drained. Land cover constitutes a combination of forest, wetlands, and agriculture. Forested areas are classified primarily as oak-hickory-pine and southern flood plain forest where the primary forest cover type consists of loblolly pine-hardwood. In this case hardwood species include sweetgum, water oak, white ash, yellow-poplar, red maple, and swamp hickory. Bottomland areas associated with major rivers typically include green ash, sugarberry, water oak, American sycamore, sweetgum and American elm. Wetlands are very common throughout the region and consist of several types including marshes, bottomland forests and pocosins. Additionally, this region includes surface waters and disturbed land.

Ecosystems in this domain are subject to seasonal fluctuations in precipitation and temperature, winter season which results in vegetation such as prairie, broadleaf deciduous forest, and evergreen conifer forests. These areas also experience high humidity, absence of very cold winters, ample rainfall heaviest in summer months, severe thunderstorms frequent in summer months, possibility of tropical hurricanes, and moderately wide range of temperatures. These characteristics of the Middle Atlantic Coastal Plain are generally synonymous with JBLE-Eustis, but significant variation exists across the installation.

2.3.1 *Vegetation Occurring on JBLE-Eustis*

2.3.1.1 **Historical Vegetation Cover.**

Historic vegetation at the installation and much of the eastern seaboard has changed dramatically since the existence of humans on the landscapes. Most notably between 15,000-20,000 years ago during the last ice age, historical theories indicate that JBLE-Eustis and surrounding Virginia would have been in what is now known as the taiga/tundra biome. The installation would have been much dryer, cooler, with spruce and fir species of the far north existing across the region. As the glaciers receded, existing in middle Pennsylvania at the time, indigenous peoples would have arrived on the installation during the early woodland period. This period was characterized the modern oak-hickory woodland vegetation and grasslands moving into the area. Fire and other natural disasters would have been the primary factors in resetting woodland habitats to early successional habitats (Gorski 2021) that would have been made up largely of herbaceous and shrub habitats until this point. Ethnobotanical surveys of the installation indicate that nuts, fruit rinds,

and many species of shrub-berries, including cranberries and blueberries endemic to more northern climates, made up much of the diet of early JBLE-Eustis inhabitants (Warrenfeltz 2023). Also at this time, native peoples would have become more sedentary focusing efforts on farming and slash/burn agriculture, and less on mobile hunting and gathering. This change would have occurred about 3,000 years ago and would have been characterized by a warming climate and increase in wildland fire and fire tolerant species in the upland reaches of the installation, and more freshwater wetland environments in the lower reaches. It is important to note that the James River at this time would have been James Creek, being much wider and shallower with historical theories indicating that earlier Paleo-Indian artifacts would be underwater by today’s time.

Further through time, at about the time European settlers arrived (400-500 years ago) in the region the habitat types would have transitioned out of the woodland period with further sea level rise, the James River rising 30 or more feet, southern pine/grassland components being added to the region, and a general stabilization of the Chesapeake Bay region into what it is today. This period, known as the historical period, would have been comprised of oak/pine dominated lowlands, oak or long leaf pine savannah in the uplands, and meadow habitats dispersed across the region that would have been caused by either nature impacts (floods, fires, storms, disease) or by human impacts (fires for hunting, accidental fire escapes, slash and burn agriculture, and land clearing by native populations). From circa 1607 to present the installation vegetative cover would have changed dramatically with influences from indigenous peoples, European settlers, and African-Americans.

2.3.1.2 Current Vegetation Cover

Three primary natural ecosystems on JBLE-Eustis were identified using data from the USAF AFCEC Environmental GIS Project. The ecosystems included forest and woodland, riparian and wetland and open water. Natural ecosystems as well as barren and sparse rock vegetation, recently disturbed or modified, agricultural/developed vegetation and developed/urban areas are summarized in Table 4.

Table 2-2. Ecosystem coverage by area.

Ecosystem Type	Coverage
Forest and Woodland	45.5%
Riparian and Wetland	19.3%
Open Water	5.7%
Barren and Sparse Rock Vegetation	0.1%
Recently Disturbed or Modified	1.2%
Agricultural and Developed Vegetation	2.4%
Developed and Urban	25.7%

The dominant ecosystems present at JBLE-Eustis are forest and woodland (45.5%), and riparian and wetland (19.3%). Slight changes in temperature and precipitation can substantially alter the composition, distribution, and abundance of species in these ecosystems, and the products and services they provide. The extent of these changes will also depend on changes in precipitation and fire. Losses of vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability will dramatically increase potential erosion rates. Rising temperatures under various climate change scenarios will likely enhance soil decomposition. Together with reductions in rainfall, this may also reduce plant productivity over large areas.

In general, forests and woodlands are susceptible to climate change. There is a temperature below which the equilibrium state of the forest appears constant, but above which the equilibrium forest cover declines steadily. This threshold represents a point where some degree of loss of the forest is inevitable. As the threshold is exceeded, there is a gradual increase in the committed die-back, with changes that are more progressive than sudden. Therefore, forest vegetation at JBLE-Eustis may experience some degree of die-back before impacts are observed. For example, if climate was stabilized in 2050, a significant die-back could still occur over the subsequent 100-200 years.

Terrestrial Habitat

Commercial forest. Commercial forest habitats at JBLE-Eustis are dominated by loblolly pine on Mulberry Island and Goose Island. Other coniferous species present in the canopy include Virginia pine and shortleaf pine. Training Areas 1 & 2 at the north boundary are predominantly hardwood forests though hardwoods do exist throughout Mulberry Island (Malette et. al., 2021). Common hardwood species include red maple, white oak, northern red oak, yellow poplar, mockernut hickory, American beech, American elm, black cherry, American sycamore, and sweetgum. Bald cypress and black gum are present on wetter soils. Understory tree species include paw-paw, blueberry, American holly, flowering dogwood, and wax myrtle. Herbaceous species include cardinal flower, marsh fern, lady fern, royal fern, sensitive fern, bracken fern, false nettle, fox grape, common greenbrier, tickseed sunflower, sessile bellwort, and lespedeza (Malette, et. al. 2021).

Urban forest. Portions of the cantonment area contain urban forest areas. This equates to approximately 480 acres though this acreage does not contain trees exclusively. Loblolly pine is the dominant tree; however, a number of mixed oaks and other hardwood species exist. Some areas contain older trees planted over 40 years ago. Such areas include (but not limited to) inbound and outbound Washington Boulevard where mixed oaks and pines line this road network and bald cypress trees line the athletic field at the intersections of Taylor Avenue and 24th Street. Landscape trees and shrubs have been planted as part of more recent construction sites.

Longleaf pine reintroduction sites. Reintroduction of longleaf pine at JBLE-Eustis began in the 2005 timeframe. Several small acreage unused sites were identified in the cantonment area. The intent was to increase biodiversity as well as plant a pine species resistant to southern pine beetle infestations. The following sites now contain young stands of longleaf pine and have been maintained annually pending availability of resources. These sites exist on Victory Boulevard, Irwin Street, within the Impact Area, and adjacent to the golf course driving range.

Early Successional Sites. Between 2020 and 2023, several early successional habitats were created by converting unused mowed grass areas or by removing undesirable vegetation and replanting selected areas with various wildflowers and to some extent Native Warm Season Grasses (NWSG). Pollinator mixes were planted at these sites. Some of the major flowering plants included:

- Blanketflower (*Guillardia* spp.).
- Tickseed (*Coreopsis* spp.).
- Black/Brown Eyed Susan (*Rudbeckia* spp.).
- Blue mistflower (*Conoclinium coelestinum*).
- Bundleflower (*Desmanthus* spp.).
- Partridge (Sensitive) Pea (*Chamaecrista nictitans*).
- Perennial Sunflower (*Helianthus tuberosus*)
- Wild Senna (*Senna hebecarpa*).
- Joe Pye Weed (*Eutrochium purpureum*).
- Sulphur Cosmo (*Cosmo sulphureus*).
- Garden Cosmo (*Cosmo bipinatus*).
- Canada Goldenrod (*Solidago canadensis*).
- Showy Aster (*Eurybia* spp.).
- *Verbena* spp.
- Maximillian sunflower (*Helianthus maximiliani*).
- Whorled Tickseed (*Coreopsis verticillate*).
- Maryland Senna (*Senna marilandica*).
- Whorled rosinweed (*Silphium trifoliatum*).
- Wild bergamot (*Monarda fistulosa*).
- Illinois Bundleflower (*Desmanthus illinoensis*).
- Hollow Joe-pye (*Eutrochium fistulosum*).
- Stiff goldenrod (*Solidago rigida*).
- Showy tickseed (*Desmodium canadense*).
- Hairy lespedeza (*Lespedeza hirta*).
- Prairie Coneflower (*Ratibida columnifera*).
- Purple Coneflower (*Echinacea purpureum*).
- Rattlesnake Master (*Eryngium yuccifolium*).
- Lance Leaved Coreopsis (*Coreopsis lanceolata*).
- Clasping Coneflower (*Rudbeckia amplexicaulis*).
- Milkweed (*Asclepias* spp.).
- Lollipop verbena/butterfly weed (*Verbena* spp.).
- Crimson clover (*Trifolium incarnatum*).
- Beebalm (*Monarda* sp.)

Quick Six Course and Back River Road Sites. Collectively these sites comprise 4.22 acres. The Building 2015 Compound West Patch was planted in 2020 with wildflower mix, but was destroyed by deer and groundhogs. It will be replanted in spring 2022. Building 2015 Compound East Patch was planted in fall 2021 with a flowering clover mix to relieve browse pressure and because it is still used as a lay-down area for equipment and disposing of wildlife carcasses. It continues to flower during spring and summer with 4 varieties of perennial clover. Back River Road Patch was planted in 2020 and then over-seeded again in 2021 with pollinator mix.

Building 1409 Site. The general area surrounding building 1409 was also once a mowed area comprising 0.36 acres. Previous habitat work involved planting several wax myrtle shrubs, but the area was not maintained due to other work priorities. Since then, the area was replanted with the pollinator mix in 2020 adjacent to the parking lot and then expanded around the building in 2021.

South Golf Course Site. These sites collectively comprise 17.45 acres. These sites were cleared of vegetation and woody competition in summer-winter of 2020 and planted in spring 2021. Results were mixed due to wet weather, planting depths, and potential golf course mowing. The Long Pond, and Golf Course V were planted in a pollinator and meadow mix and were mostly successful but will need to be augmented in the coming seasons. The Long Fairway (thin strip to the east) was planted in a roadside pollinator mix composed of mostly Rudbeckia and Coreopsis that did very well but is short lived. The Archery Range was cleared of invasive species and woody competition in 2021 and will be planted in an upland bird/wildlife mix in spring 2022.

Mulberry Island Road/Taylor Avenue site. This site was originally 0.71 acres of unused land that was maintained by mowing. It was converted into an early successional habitat with forbs in the 2009-time frame and managed for two years before time and manpower constraints precluded effective maintenance. In spring 2020, the existing undesirable vegetation was removed, and the site replanted with a pollinator mix intermixed with sparse NWSG.

Irwin Street site. This 0.72-acre site was originally planted with longleaf pine and has been maintained as such. In the spring of 2021, the area was enhanced by planting a pollinator mix followed by a flowering clover mix planted in the fall.

Landfill 15. Landfill 15 is a closed landfill for which remediation was completed under the ERP. Its remediation requires maintaining the integrity of a cap by precluding growth of trees. Some attempts to manage this site as an early successional habitat with herbaceous vegetation was performed several years ago. However, uncertainty as to whether the site would house solar panel resources precluded further habitat management. The site has potential as an early successional habitat though request for funds is not considered appropriate unless the site is designated for habitat management by the chain of command.

Aquatic Habitat

Aquatic habitats on JBLE-Eustis include the lower James and Warwick Rivers, Eustis and Browns Lakes, Skiffes Creek, Bailey Creek, and several unnamed tidal creeks and ponds. The shallow coves of Eustis Lake are characterized primarily as lacustrine wetland communities dominated by emergent species; however, there are a few coves that are dominated by stands of bald cypress. An upland community of mixed hardwood-pine forests surrounds the lake. Browns Lake has little emergent vegetation and is surrounded by shrubs and predominantly loblolly pine. Uplands on the western and northern sides are vegetated with mixed hardwood-pines. The drainage on the southern end flows through a riparian woodland and into a tidal marsh prior to entering the Warwick River. JBLE-Eustis initiated a project in 1999 in cooperation with the Chesapeake Bay Alliance to restore submerged aquatic vegetation (SAV) in the James River. Follow-on studies in

2007 indicated that none of the initial plantings of SAV survived. Water turbidity may have precluded successful reestablishment of SAV.

Invasive Terrestrial and Aquatic Plants

Several adventive plant species exist at JBLE-Eustis. These plants have varying degrees of invasiveness and impact various military missions. The Environmental & Natural Resources Division (ENRD, the organizational name that preceded the Environmental Element before BRAC 2005) staff conducted several surveys to determine those species and map their distribution in various areas. A planning level survey that included fauna and invasive vegetation was conducted in 2004-2005 (Versar, 2006). In September 2005, staff from the U.S. Army Environmental Center and BASF conducted a Pest Management Program Assistance Visit that surveyed for invasive plants. Additionally, a Timber Inventory and Forest Management Plan was completed in 2007 which included information on invasive vegetation in installation forest compartments. Collectively, these surveys/reports were incorporated into the JBLE-Eustis Invasive Species Management Plan that was prepared by the U.S. Fish and Wildlife Service in July 2008. This plan constituted the original Invasive Species Management Plan used by the installation. From 2009-2011, several invasive species control test plots (JBLE-Eustis Invasive Species Control Test Plots, final report, November 2009) and actual treatment projects were performed. The results were incorporated into this updated plan. Another timber inventory that included assessing invasive plants in forest compartments was completed in 2021. Natural resources staff conducted assessments and treatments for invasive vegetation between 2008-2023 with additional species being documented.

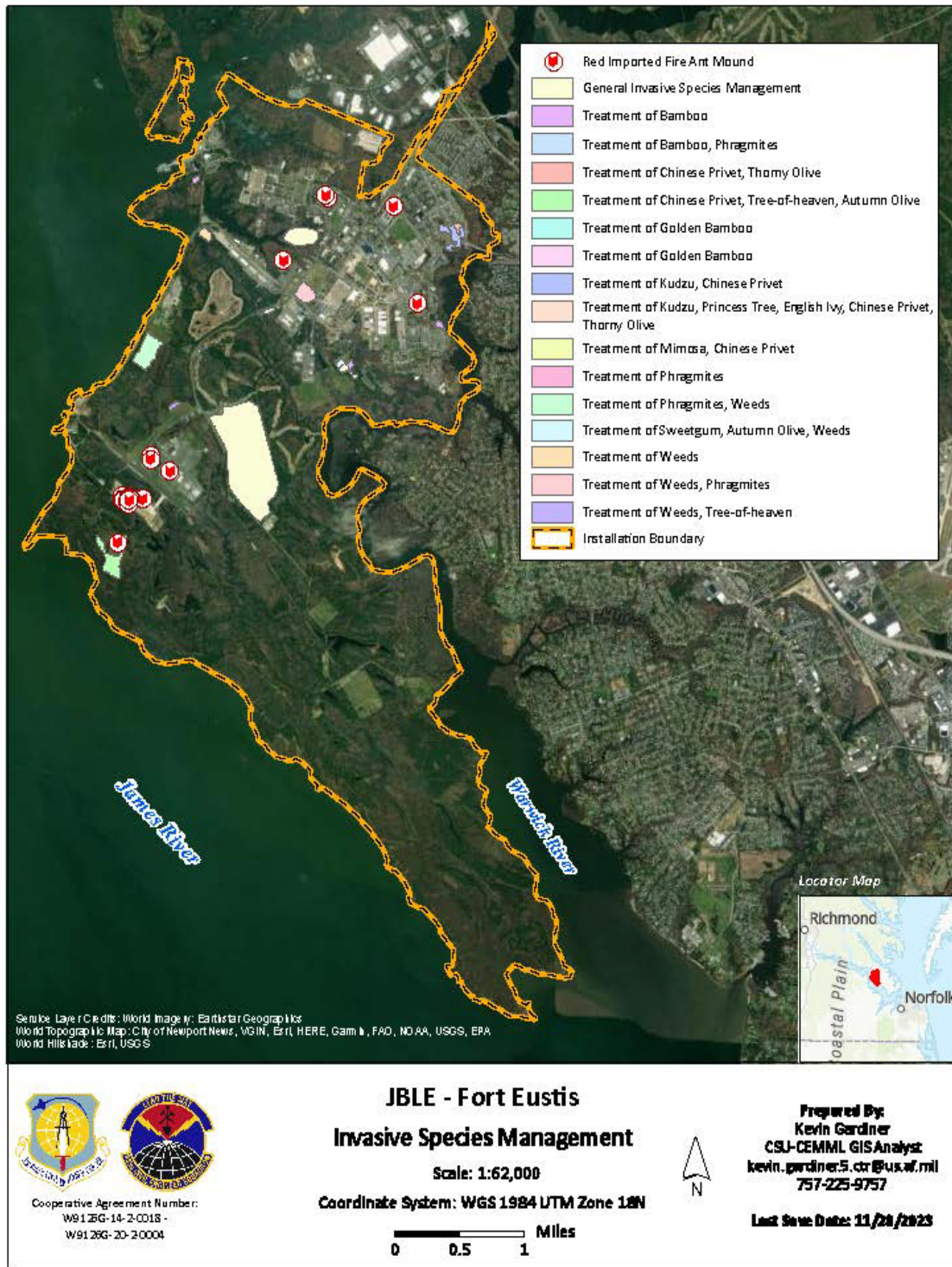


Figure 2-3. Invasive Vegetation Management on JBLE- Eustis.

Cumulatively, 41 adventive plants having varying degrees of invasive impact have been documented on the installation to date:

- Norway maple (*Acer platanoides*)
- Tree of Heaven (*Ailanthus altissima*)
- Mimosa tree (*Albizia julibrissa*)
- Garlic mustard (*Alliaria petiolata*)
- Field garlic (*Allium vineale*)
- Mugwort (*Artemisia vulgaris*)
- Chinese violet (*Asystasia gangetica*)
- Paper Mulberry (*Broussonetia papyrifera*)
- Field Bind Weed (*Convolvulus arvensis*)
- Oriental bittersweet (*Celastrus orbiculata*)
- Spotted knapweed (*Centaurea biebersteinii*)
- Canada thistle (*Cirsium arvense*)
- Bull thistle (*Cirsium vulgare*)
- Field bindweed (*Convolvulus arvensis*)
- Asiatic dayflower (*Commelina communis*)
- Crown vetch (*Coronilla varia*)
- Scotch broom (*Cystisus scoparius*)
- Orchard grass (*Dactylis glomerata*)
- Common teasel (*Dipsacus sylvestris*)
- Russian olive (*Elaeagnus angustifolia*)
- Thorny Olive (*Elaeagnus pungens*)
- Autumn Olive (*Elaeagnus umbellata*)
- Weeping lovegrass (*Eragrostis curvula*)
- Tall fescue (*Festuca arundinacea*)
- Meadow fescue (*Festuca pratensis*)
- Gill-over-the-ground (*Glechoma hederacea*)
- English Ivy (*Hedera helix*)
- Japanese hops (*Humulus japonicus*)
- Hydrilla (*Hydrilla verticillata*)
- Yellow Flag Iris (*Iris pseudacorus*)
- Shrubby Bushclover (*Lespedeza bicolor*)
- Chinese lespedeza (*Lespedeza cuneata*)
- Chinese Privet (*Ligustrum sinense*)
- Japanese Honeysuckle (*Lonicera japonica*)
- Morrow's honeysuckle (*Lonicera morrowii*)
- Tartarian honeysuckle (*Lonicera tartarica*)
- Birdsfoot trefoil (*Lotus corniculata*)
- Chinaberry (*Melia azedarach*)
- Yellow sweet clover (*Melilotus officinalis*)
- Nepalese Browntop/Japanese Stiltgrass (*Microstegium vimineum*)
- White mulberry (*Morus alba*)

Invasive plants impact missions in different ways depending on the species and the location. Some directly affect training while others may affect training and other missions. All species essentially degrade the natural habitat and adversely affect biodiversity and overall ecosystem health. Most of the invasive vegetation occurs in terrestrial habitats while Common Reed and Hydrilla occur more so in aquatic environments. Several have considerably more impacts on military missions:

Common reed. Common Reed grows in very thick, tall stands that out compete native aquatic/wetland vegetation. This causes significant degradation of line of sight thus impacting force protection as well as impeding movement through certain areas. Additionally, the thick stands can serve as fuel for wildfires. Currently, this species is beginning to encroach on manmade wetlands constructed along Harrison Road that was intended to reduce erosional impacts as well as improve shoreline aesthetics for picnics and wildlife viewing and improving habitat to support recreational sport fishing. It has colonized the FEDMMA facility serving as a propagation area and mars aesthetics in areas around the golf course.

Tree of Heaven. Tree of Heaven especially combined with Chinese Privet, Autumn Olive and Japanese Honeysuckle are of particular concern to training areas. These plants whether combined or separately create thick, impenetrable stands that degrade movement and operations. This degrades the quality of or in some cases prevents training tasks such as land navigation, tactical bivouac, and small unit tactics.

Kudzu and English ivy. Kudzu has been largely brought under control at JBLE-Eustis. A small stand had been found and effectively treated in Training Area 2. Additionally, larger stands were documented and effectively treated near the second access gate and areas behind the elementary school. Nonetheless, surveillance continues since this plant could be highly destructive to forested areas if not controlled. currently has only a minimal effect in training areas but has potential to expand. It has overwhelmed the northern portion of the installation near the second access gate. It has killed or will eventually kill a number of hardwood and pine trees that eventually become hazard trees. English ivy also poses as a similar threat to trees in cantonment and natural areas.

Johnsongrass, Tall Fescue and Shrubby Bushclover. Johnsongrass, Tall Fescue and Shrubby Bushclover adversely affect open areas in portions of cantonment, some training areas and installation restoration sites. These plants out compete native vegetation degrading natural habitats, degrading aesthetics, and impacting restoration efforts. Additionally, thick stands of these plants may serve as harborage for ticks.

Additional details on the effects on missions and their management are articulated in the Invasive Species Management Plan in Section 15.

2.3.1.3 Future Vegetation Cover

In general, forests and woodlands are susceptible to climate change. There is a temperature below which the equilibrium state of the forest appears constant, but above which the equilibrium forest cover declines steadily. This threshold represents a point where some degree of loss of the forest is inevitable. Therefore, forest vegetation at JBLE-Eustis may experience some degree of die-back before impacts are observed. For example, if climate was stabilized in 2050, a significant die-back could still occur over the subsequent 100-200 years. The future vegetation cover of the installation is expected to shift away from temperate species and more towards tropical and arid species. Tree species such as maple and poplar will likely give way to increased pine and oak species. Similarly, herbaceous, and cool season grass covers will give way to shrubby and vining vegetation. The invasion of common reed will increase in speed as sea level rises and inundating waters further remove woodland habitats and quickly transition into tidal marsh or ephemeral pond habitats. Across southern reaches of the United States, the timber industry is slowly shifting to more heat tolerant timber species such as slash and longleaf pine, however the temperature increase coupled with increased wetting of the soils at JBLE-Eustis may negate this option.

2.3.1.4 Turf and Landscaped Areas

Approximately 30% of the installation is in developed or semi-developed landscaping, much of which is in turf grass that is dominated by a Bermuda grass and fescue mix. In recent years the Army units have shifted away from landscaping by the agent or unit in charge of a building and grounds and landscaping contracts have been slow to evolve. Therefore, much of the landscaping across JBLE-Eustis is aging, failing, or is no longer landscaped. 733 CES is the proponent for grounds maintenance and landscaping for the installation and these topics are not routinely discussed within this plan. There are two exceptions.

Landscape Management Plans for construction projects are required to be reviewed by the CEIE IAW EMP 4.4.6.16. CEIE reviews these plans to ensure proper landscape plant selection, exclusion of invasive or noxious species, and for proper planting technique. Historically the contracting officers have failed to include CEIE in pre-planning and post-construction reviews and inspections.

Hazard trees often are those that were once planted for landscaping purposes. Nearly one third of the hazard trees on the hazard tree list maintained by CEIE were at one time included in landscaping design and planning. Maintenance and removal of these trees usually falls to the 733 CES Operations Flight. One concern that have been recognized and must be discussed within the next 5 years of this plan is replacing hazard trees that have been removed. Trees and landscaping serve many purposes on the installation such that they are aesthetically pleasing, reduce pollution and water runoff, reduce parking lot heat and shade buildings and recreational facilities, provide habitat for wildlife, and reduce carbon output into the atmosphere. Many of the dead or dying trees or landscaping shrubs are dying as a result of improper landscaping (mulch depth, adjacent construction projects, incorrect plant choice) or are dying of old age. Without replacement of these trees being removed, most parking lots and common areas on the installation will be void of large shade trees within the next 20 years.

2.3.2 *Fish, Wildlife and Invertebrate Fauna*

Surveys and inventories. Several wildlife surveys and inventories have been conducted at JBLE-Eustis since 1994. Such surveys were performed for mammalian, avian, herpetofauna, fish and shellfish and insects, and to a lesser extent other terrestrial arthropods. The following surveys were performed:

- A Natural Heritage Zoological Inventory of FE, Virginia (DCR, October 1997).
- Report of Bat Survey Results at Fort Story, Fort Eustis and Fort Lee (September 1998).
- Spring Migration Bird Survey Results on U.S. Army Garrisons Fort Eustis and Fort Story (Waterways Experiment Station, July 2000).
- Breeding Bird Survey Results on the U.S Army Garrisons Fort Eustis and Fort Story, VA (Waterways Experiment Station, July 2000).
- Assessment of Fishery Resources for Enhanced Management of Eustis Lake, FE, Virginia (U.S. Fish and Wildlife Service, June 2004).
- Planning Level Surveys for Amphibians and Reptiles, Mammals, Birds, and Fish, As Well As Pest Insects and Invasive Plants at FE, Virginia in 2004-2005 (Versar, August 2006).
- Mapping, Characterization, and Field Verification of Existing Vernal Pools at Fort Eustis and Fort Story, Virginia (Versar, August 2006).
- Assessment of Vernal Pool at Fort Eustis (US Fish & Wildlife Service, 2009).
- A characterization study of selected vernal pools of JBLE-Eustis was completed in 2010.
- An Inventory of Insect and Medically Important Arthropod Taxa at Joint Base Langley-Eustis, JBLE-Eustis, Virginia (Christensen, February 2014).
- Forest Insect Survey at Joint Base Langley-Eustis, JBLE-Eustis, Virginia (Parsons, 2015).
- Fauna Survey for Amphibians, Reptiles, Small Mammals, and Birds at Joint Base Langley-Eustis, JBLE-Eustis, Virginia (Parsons, 2015).
- Bat Survey for Ft. Eustis (The Conservation Management Institute, Virginia Polytechnic and State University, September 2016).
- Tick & Tick-Borne Disease Threat Assessment (USA Public Health Command and the College of William & Mary, 2007-2019 which includes bird and mammalian host surveys).
- Turtle Diversity of US Army Installation, Fort Eustis, Virginia (Dolan, J.D. and T.P. Christensen. 2007. Turtle diversity of US Army installation, JBLE-Eustis, Virginia. *Catesbeiana*, 27(2): 72-77.).
- 2017 Mosquito Species Inventory (Christensen, 2017).
- 2019-20 JBLE-JBA Natural Resources Support, CIRE, University of MT, 23 Sept 2021.
- Insects, Other Arthropods & Other Macroinvertebrates Observed on Fort Eustis: Understanding the Significance of Invertebrate Taxa on Military Missions, Updates 1-4, (Christensen, 2018-2024).

Mammals. Forty native mammal taxa have been documented on the installation. This includes 16 insectivores (consisting of 13 bats, 2 shrews, and 1 mole), 13 rodents, one rabbit, 8 carnivores, and whitetail deer. Most of these taxa occur throughout the year; however, black bear are rare with only two known sightings and some bats are migratory. Eight species are listed species or candidate species under USFWS or DWR listing status. A list of the mammals documented at JBLE-Eustis is presented in Section 14.1.7 Appendix I.

Birds. Bird taxa constitute 184 species including 24 Anseriformes (waterfowl), 14 Pelecaniformes (loons, egrets, herons, bitterns, pelicans, cormorants, and grebes), 33 Charadriiformes (sandpipers, terns, snipe, gulls, and rails), 1 Coreciiformes (kingfishers), 2 Falconiformes 9 Accipitriformes (eagles, hawks, harriers, vultures, osprey), Galliiformes (bobwhite quail), Apodiformes (swifts and hummingbirds), 84 Passeriformes (perching birds), Piciformes (woodpeckers), 3 Strigiformes (owls), 1 Cuculiformes (cuckoos), and 1 Caprimulgiformes.

Many bird taxa are migratory occurring on the installation in certain times of the year. Many are uncommon on JBLE-Eustis including (but not limited to) cattle egret (*Bubulcus ibis*), American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), common loon (*Gavia immer*), snowy egret (*Egretta thula*), yellow-crowned night-heron (*Nycticorax violaceus*), common goldeneye (*Bucephala clangula*), red-shouldered hawk (*Buteo lineatus*), American kestrel (*Falco sparverius*), clapper rail (*Rallus longirostris*), spotted sandpiper (*Actitis macularia*), Red-headed woodpecker (*Melanerpes erythrocephalus*), pileated woodpecker (*Dryocopus pileatus*), bank swallow (*Riparia riparia*), hermit thrush (*Catharus guttatus*), winter wren (*Troglodytes troglodytes*), palm warbler (*Dendroica palmarum*), pine warbler (*Dendroica pinus*), indigo bunting (*Passerina cyanea*), and savannah sparrow (*Passerculus sandwichensis*). A list of the birds documented at JBLE-Eustis is presented in Section 14.1.8 Appendix J.

Fish and Shellfish

Eustis Lake, Skiffes Creek, Bailey Creek, James River, and Browns Lake have been surveyed by various entities including the NR&IPM Team, ERP contractors and Virginia DWR. Nearly 40 species were identified from surveys, indicating a high level of species diversity. American oysters (*Crassostrea virginica*) are found in the James River and its tributaries near JBLE-Eustis. Blue crabs (*Callinectes sapidus*) are found in tidal habitats and constitute a large portion of local commercial fishing revenue and culture. Shellfish populations in the region have been declining for many years as a result of general water quality problems in the Chesapeake Bay and its tributaries (USATCFE 1998). A list of fishes and shellfish observed at JBLE-Eustis is presented in Section 14.1.9 [Appendix K](#). However, data on crustaceans and other aquatic invertebrates associated with inland aquatic habitats within the installation boundaries is lacking.

Reptiles and Amphibians

A variety of reptiles and amphibians are known to inhabit JBLE-Eustis. A list of the reptiles and amphibians documented at JBLE-Eustis is presented in Section 14.1.10 [Appendix L](#). As of the date of this INRMP, no venomous snakes have been documented on the installation.

Macroinvertebrates

Macroinvertebrates include arthropods (such as insects, spiders, harvestmen, ticks, other mites, crayfish, crabs, copepods, isopods, amphipods, etc.), flatworms, snails, clams, and annelids (such as earthworms, leeches, etc.). These organisms are critical components of the ecosystem and have numerous ecological roles. Insects have the greatest diversity of any group of organisms and are often overlooked when one considers management of wildlife and habitats. Their species richness and high fecundity make this group substantial components of biomass. Collectively macroinvertebrates as well as multicellular microscopic forms serve as food sources, predators, parasitoids, disease vectors, soil constituents, pollinators, decomposers, seed dispersers, and herbivory. Some may be pests of habitat vegetation and wildlife.

Several arthropod surveys, inventories and other observations have been performed with respective taxa being documented. Tick and tick-borne diseases threat assessments were conducted from 2007 through 2019. Mosquito species surveys were performed in 2009 and 2017. Two separate baseline insect surveys were performed between 2011 and 2015 with data including preexisting collections and other preexisting data. Annual macroinvertebrate taxa documentation continued through 2023. The primary focus has been on terrestrial insects and arachnids though some aquatic forms have been included. Natural resources staff recorded 18 insect orders (Class Insecta) and 6 arachnid orders (Class Arachnida) with specimen identification made at the lowest taxonomic level as possible. Arthropod taxa and related information are found at Section 14.1.11 – Appendix M: *Insects, Other Arthropods & Other Invertebrates Observed on JBLE-Eustis*. The inventory data continues to be evaluated to identify invasive taxa and the degree of risk, taxa serving as natural biological control, pollination contribution, habitat relationships, relationships with other wildlife, and those that may function as environmental indicators. Annual arthropod data collection continues and is incorporated into the natural resources annual work plan with an initial arthropod inventory being included in the JBLE-Eustis Integrated Natural Resources Management Plan. Future invertebrate assessments include inventories of proturans, collembolans, diplurans, millipedes, centipedes, and both terrestrial and aquatic crustaceans.

Important Wildlife Diseases. Disease in wildlife is a natural phenomenon. However, various factors or conditions contribute to increased risks and adverse outcomes in certain wildlife populations and in some cases directly affecting human health. Currently, the following wildlife diseases are considered important for this INRMP period.

Rabies. This viral disease has been documented in raccoons, red foxes, and opossums at JBLE-Eustis. Consequently, this disease remains a possibility among mammals on the installation. Natural resources staff are typically the first responders regarding human-wildlife conflicts. These personnel coordinate directly with US Army Department of Public Health immediately if any risk of exposure is identified.

Chytridiomycosis. Amphibians are at risk of at least two chytrid fungi species globally. This disease causes high mortality among several anuran and caudate species.

Batrachochytrium dendrobatidis (Bd) at JBLE-Eustis. The chytrid fungus, *Batrachochytrium dendrobatidis* adversely affects species of frogs and toads. In 2013, JBLE-Eustis participated in a Department of Defense-wide amphibian disease survey for this fungal pathogen (Lannoo et al. 2014). Two individual anurans tested positive of fifteen individuals tested. At that time infection rate was deemed low based number and species of anurans tested and distances between sites. Future assessment shall be performed when resources are available. Additionally, JBLEI 32-102 and this INRMP prohibit the use of frogs, toads and tadpoles as fishing bait, and wildlife/fauna removal from or liberation onto JBLE-Eustis is prohibited (Section [7.14](#)).

Batrachochytrium salamandrivorans (Bsal). The salamander chytrid fungus *Batrachochytrium salamandrivorans* was first described in 2013 based on observations among wild and captive fire salamander (*Salamandra salamandra*) reported in Europe. It is not yet reported in the United States and consequently, would not be expected to occur at JBLE-Eustis at this time. Nonetheless, natural resources staff shall monitor federal and state reports, and the literature.

Additionally, JBLEI 32-102 and this INRMP prohibit the use of salamanders as fishing bait, and wildlife/fauna removal from or liberation onto JBLE-Eustis is prohibited (Section [7.14](#)).

Snake Fungal Disease (SFD). SFD is an emerging disease observed among several snake species in the Eastern United States and has been observed in Virginia since the early 1990s. Sources suggest the fungal pathogen may be *Ophidiomyces ophiodiicola* and causes lesions and blindness in snakes, that eventually lead to other infections, starvation, and death. Several species occurring at JBLE-Eustis have been diagnosed including Northern watersnake (*Nerodia sipedon*), Eastern black racer (*Coluber constrictor*), common ribbonsnake (*Thamnophis sauritus*) and Eastern ratsnake (*Pantherophis alleghaniensis*). Natural resources staff participated in a DoD-wide survey in 2020 and 2021 and captured a total of 67 snakes during the two-year survey. An astounding 17% of all snakes sampled tested positive for SFD even when lesions were not present.

Emydomyces testavorans. Potential *Emydomyces testavorans* pathogen infection of turtles. A woodland box turtle (*Terrapene carolina carolina*) was observed having a deteriorating plastron during a box turtle survey of Training Areas 1 and 2 in 2017. This was observed in a different individual in the same general area in 2023. Consultation with wildlife veterinarians suggested a possible *Emydomyces testavorans* pathogen infection. Further survey work is under consideration in 2024.

Hemorrhagic Disease (HD). HD is the most important infectious disease of white-tailed deer in the southeastern US including Virginia. This disease is caused by the Epizootic Hemorrhagic Disease virus that is transmitted from biting midges in the genus *Culicoides*. HD outbreaks can occur annually, but with annual variations of severity, related to densities of *Culicoides*, individual deer immunity and virulence of the virus. HD outbreaks occur most often in late summer and early fall (August through October). Mortality rates from HD in southeast Virginia average less than 10% but can exceed 25% of the deer population. Environmental conditions that favor high *Culicoides* densities include mild winters, hot summers, and June drought. While likely to occur at JBLE-Eustis annually, significant deer mortality as a result of HD has not occurred since 2005 in which more than 50 deer were found exhibiting signs of HD infection. The disease is not transmittable to humans though *Culicoides* are significant nuisance biting flies of humans. Common names for *Culicoides* species include biting midges, punkies and no-see-ums with at least one species occurring at JBLE-Eustis.

Canine distemper at JBLE-Eustis. Canine distemper is a highly contagious and often fatal disease that affects both domestic canids and wild carnivores including raccoons. The disease is caused by a virus and is spread through contact with bodily fluids and feces. A JBLE-Eustis 2011 wildlife disease survey of 64 raccoons revealed no infected individuals. However, the disease was observed in raccoons in earlier surveys. Immunizations of domestic animals is the best preventative measure. Symptoms are similar to those of rabies; however, canine distemper is not transmissible to humans.

Leptospirosis at JBLE-Eustis. Leptospirosis is a zoonotic disease caused by a *Leptospira* bacterial infection. A 2012 JBLE-Eustis wildlife disease survey identified 4 infected raccoons of 10 individuals sampled.

Sarcoptic mange. No cases of mange (as caused by the *Sarcoptes scabiei* mite) have been clinically diagnosed in any mammalian species at JBLE-Eustis date but mite exists in the region.

Climate Change and Fish and Wildlife

Fish and wildlife populations at JBLE-Eustis could experience significant impacts from projected climate changes. While rising temperatures may not lead to direct impacts on species, SLR, SS inundation, and storm frequency and intensity, could impact fauna. Projections suggest much to all the freshwater habitat on JBLE-Eustis will become inundated and subjected to saltwater intrusion, as well as over half of natural areas located south of the urbanized areas. Much of the land projected to be lost includes forests, resulting in a fragmented landscape of small islands. Species that rely on freshwater, including amphibians and freshwater turtles, could become locally extinct due to habitat loss. While some turtles may exhibit moderate tolerance to brackish water, amphibians such as salamanders, frogs and toads will not be able to tolerate the changes.

Fragmented islands created by SLR could also remain suitable for the roughly 184 species of birds that inhabit JBLE-Eustis. Significant flooding events (20-year or 100-year floods, for example) would cause temporary, complete submersion of virtually all-natural habitat south of the cantonment area, leaving no retreat corridors, and creating extremely difficult habitat conditions for terrestrial mammals – especially since the landscape will already be fragmented. As a result, competition will be minimal for birds inhabiting those islands.

Changing vegetation patterns on JBLE-Eustis could have a negative impact on specialist wildlife species that have historically depended on specific native plant species for survival (Dukes & Mooney, 1999). The most dramatic change will likely be within the forested sections of the installation where tree species composition will change dramatically due to saltwater inundation and salination of the soils. Little research has been conducted to predict which species are likely to remain and which will die off. Changing conditions may also create open niches for non-native invasive species to expand onto the installation. Newly arriving invasive species often have the ability to outcompete native species that are already experiencing reduced fitness due to shifting environmental conditions (Hellmann, Byers, Bierwagen, & Dukes, 2008). Rising temperatures can affect timing of overwintering invertebrate emergence; this would negatively impact migrating birds that coincide their migration with the massive release of nutrients provided by the emergence (Both et al., 2010).

Rising temperatures could also result in increased potential for zoonotic and infectious diseases of animals that are transmittable to humans, particularly such as rabies from mammals and arthropod-borne diseases from ticks and mosquitoes. Lentic habitats are susceptible to rapid fluctuations in water parameters. Increasing air temperatures will result in increasing water temperatures, creating more favorable environments for future algal blooms (Paerl, Hall, & Calandrino, 2011). Rising water temperatures will also result in decreased dissolved oxygen content, further decreasing habitat quality for freshwater fish and amphibians.

2.3.3 Threatened and Endangered Species and Species of Concern

Surveys and inventories. The surveys and inventories discussed in Section [2.3.2.2](#) and [2.3.3](#) included rare, threatened, and endangered animal and plant species. Species targeted in the survey

included mammals, birds, reptiles, amphibians, fish, invertebrates, and plants listed or determined to be candidates for listing by the USFWS, VDWR, VDCR, or VDACS. Natural resources staff request funding to conduct plant and animal surveys and inventories every five years.

Listed species and regulatory coordination. Consultation takes place with the USFWS regarding federally listed species occurring on the installation while consultation with the National Oceanic & Atmospheric Administration (NOAA) occurs for those species occurring in adjacent aquatic systems. Identification of species subject to USFWS jurisdiction is accomplished by comparing species identified in surveys and inventories to the Service's Information, Planning and Consultation system (IPaC). The installation boundary was sketched into the IPaC system to generate a threatened and endangered species list. The IPaC system generated two possible species, the Northern Long-Eared Bat (*Myotis septentrionalis*) and the Black Rail (*Laterallus jamaicensis*). The Northern Long-Eared Bat was first documented during the bat survey in 2016 with two males captured in mist nets as well as via acoustic means. The Black Rail has not been documented on the installation. The formal wildlife surveys noted in Section 2.3.3 did not document this species nor have natural resources staff observed the species during field work. On 6 February 2012, the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) was listed as Federally endangered and by virtue of the Commonwealth's adoption of the federal list, this species became state endangered as of 1 January 2013. This species does not occur on JBLE-Eustis property but does exist in the adjacent water bodies of the James River and its tributaries. Furthermore, management responsibility is the National Oceanic & Atmospheric Administration (NOAA) as opposed to USFWS. Consequently, the sturgeon does not appear in the IPaC system.

Rusty patched bumble bee (*Bombus affinis*). This species was listed as endangered effective March 21, 2017. It is not listed in the IPaC system for area of the installation; however, various sources include Virginia as part of the species historical range. Specific information concerning its distribution is not available. JBLE-Eustis has conducted insect inventories; however, the limited data exists for apids. The presence of the rusty patched bumble bee on JBLE-Eustis remains unknown; however, U.S. Air Force Pollinator Conservation Reference Guide (2017) suggests the possibility.

Potential Candidate Species. Candidate species are plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act (ESA), but for which development of a proposed listing regulation is precluded by other higher priority listing activities. The current list of FWS candidate species is available at <https://ecos.fws.gov/ecp/report/candidate-species>. Consequently, JBLE-Eustis natural resources staff monitors statuses of candidate species and record those known to occur on the installation. Currently, the spotted turtle (*Clemmys guttata*), the tricolored bat (*Perimyotis subflavus*), and monarch butterfly (*Danaus plexippus*) are being considered and are known to occur at JBLE-Eustis.

State Listed Species. During the bat survey in 2016 (and during the 2017 survey), two state-endangered bat species, the little brown bat (*Myotis lucifugus*) and the tri-colored bat (*Perimyotis subflavus*) were documented. Both species were added to the list of state endangered species on April 1, 2016.

2.3.4 *Wetlands and Floodplains*

Wetlands Inventory. JBLE-Eustis contains a large wetland system in the lower James River. The USACE-Norfolk District (Regulatory Branch) originally evaluated 6,520 acres of JBLE-Eustis land (this an estimated 95% of the installation and delineated those areas determined to be jurisdictional wetlands excluding Training Area 30, a small portion of Training Area 28 containing a bald eagle nest and the majority of the Impact Area). Goose Island was not installation property at that time. This was completed in September 2013; however, additional review and revisions were effected in 2014. The final delineation is documented in a letter dated 18 December 2014 (Annex F). Those areas delineated as wetlands remained valid through December 2019.

In August 2022, AFCEC-ISS was able to initiate a new delineation project at JBLE-Eustis through the Center for Environmental Management of Military Lands (CEMML) at Colorado State University. This project began in September 2022 and completed by February 2023. The project covered the entire installation including the recently acquired Goose Island parcel and Training Area 30 that had not been included previously. It did omit the impact area. CEIE natural resources staff forwarded the delineation project deliverable to the USACE-Norfolk District Regulatory Branch on 9 March 2023 requesting review and validation. At the time this INRMP was prepared, no response had been received. However, once the validation occurs, the new delineation remains valid for a 5-year period.

JBLE-Eustis contains an estimated 3,652.96 acres of wetlands based on the CEMML project (Wetlands Delineation Report, Joint Base Langley-Eustis, Virginia, Center for Environmental Management of Military Lands, February 2023). The CEMML Wetlands Delineation Report represents the best available wetland data. It contains detailed maps and other information and should be consulted when planning projects or assessing habitat quality.

Estimated wetland cover types and estimated area coverage based on Wetlands Delineation Report, Joint Base Langley-Eustis, Virginia, Center for Environmental Management of Military Lands, February 2023 is presented in Table 5-1. This information is used as a guide until formerly validated by the USACE.

Estimated wetland cover types and estimated area coverage based on Wetland Delineation Report.

Table 2-3. Estimated Wetland Types and Deepwater Habitat Types on JBLE-Eustis

Wetland Classification¹	Acreage	Wetland Classification1	Acreage
E1UB	595.95	L1UB	79.16
E2EM	643.76	PEM	76.85
E2EM1	1,136.33	PEM1	21.71
E2FO	79.21	PFO	120.76
E2FO1	46.67	PFO1	161.08
E2FO4	503.3	PFO4	154.03
E2RS2	1.9	PSS1	22.05
E2SS3	4.15	E2US2	5.05

Table 2-3. Estimated Wetland Types and Deepwater Habitat Types on JBLE-Eustis

Wetland Classification ¹	Acreage	Wetland Classification ¹	Acreage
		Total	3652.96

The Wetland Type codes are defined as:

- E1UB = Estuarine Unconsolidated Bottom (Open Water)
- E2EM = Estuarine Emergent Wetland
- E2EM1 = Estuarine Persistent Wetland
- E2FO = Estuarine Forested Wetland
- E2FO1 = Estuarine Forested Broad-leaved Deciduous Wetland
- E2FO4 = Estuarine Forested Needle-leaved Evergreen Wetland
- E2RS2 = Rocky Shore (rubble)
- E2SS3 = Estuarine Scrub-Shrub Broad-leaved Evergreen Wetland
- E2US2 = Estuarine Unconsolidated Shore (Sand)
- L1UB = Lacustrine Unconsolidated Bottom (Open Water)
- PEM = Palustrine Emergent Wetland
- PEM1 = Palustrine Emergent Permanent Wetland
- PFO = Palustrine Forested Wetland
- PFO1 = Palustrine Forested Broad-leaved Deciduous Wetland
- PFO4 = Palustrine Forested Needle-leaved Evergreen Wetland
- PSS1 = Palustrine Scrub-Shrub Broad-leaved Deciduous Wetland

Validated delineated wetland data is used for project level analysis instead of NWI data. NWI data lacks completeness because of photo-interpretation problems, map scale, and lack of ground truthing associated with preparation of NWI maps. NWI maps are most useful as a general approximation of wetland resources and do not provide sufficient detail to evaluate potential impacts of proposed activities on specific wetlands. Therefore, a jurisdictional determination by the USACE shall be made before any land disturbances or activities that could adversely impact wetlands on JBLE-Eustis. Any project/action proposed for any given area must be coordinated with 733 CES/CEIE to determine wetland boundaries, impacts and permitting requirements.

Currently, there are four mitigation wetland sites on JBLE-Eustis (see Annex M). These sites were constructed as part of compensatory mitigation for construction projects many years ago. These sites must be maintained as wetlands to perpetuity unless alteration is otherwise approved by the USACE. A map depicting the general location of these sites is located at Annex N.

Wetlands on JBLE-Eustis include both tidal and nontidal wetlands. The majority of the wetlands are tidal marshes. The major tidal marsh vegetation communities include 44 percent black needlerush (*Juncus roemerianus*); 28 percent saltmarsh cordgrass (*Spartina alterniflora*); 11 percent community assemblage of big cordgrass (*Spartina cynosuroides*), saltmeadow cordgrass (*Spartina patens*), and cattails (*Typha* spp.); 9 percent big cordgrass; 4 percent groundsel-tree (*Baccharis halimifolia*); 2 percent brackish and freshwater mixed species; and 2 percent pickerelweed (*Pontederia cordata*), arrow arum (*Peltandra virginica*), and other species. In non-tidal, upstream creek sections, where salinities are very low, marsh species such as marsh mallow (*Hibiscus moscheutos*), cattails (*typhus spp.*), and saltbush (*Atriplex spp.*) occur.

Freshwater wetland vegetation includes duckweeds (*Lemna* spp.), watermeal (*Wolffia* spp.), cattails, willows (*Salix* spp.), and goldenrods (*Solidago* spp., Terwilliger Consulting 1998a). Figure 5-5 depicts wetlands on JBLE-Eustis.

Ephemeral pools are seasonal, freshwater wetlands that hold water for a portion of the year, usually in a contained basin with no water outlet, and support the breeding activity of amphibians and macro-invertebrates, but do not contain fish populations. As temporary, aquatic environments, vernal pools are known officially in Virginia as isolated, nontidal wetlands. Monitoring of these unique wetlands would provide information on the occurrence and distribution of obligate species. An estimated 84 acres of vernal pools exist at JBLE-Eustis.

2.3.5 Other Natural Resource Information

Conservation Areas.

Designation and protection of areas on DoD installations that warrant special conservation efforts are authorized in DoD Instruction 4715.03. Conservation areas include botanical areas, ecological reserve areas, geological areas, riparian areas, scenic areas, zoological areas, watchable wildlife areas, and traditional cultural places having officially recognized special qualities or attributes. Clearing or disturbance of the land in the conservation areas is restricted and requires prior coordination with USFWS and VDCR-VDNH.

Warwick River North Seeps. This 11-acre conservation area of forested hillsides and ravines occurs along the Warwick River. The tidewater interstitial amphipod (*Stygobromus araeus*), a federal species of concern and former Category 2 candidate, has been collected in two of the groundwater seepage habitats located in a ravine between the Warwick River and a residential area. Both seepages dry completely (or nearly so) in summer or early fall during years of below average precipitation. Freshwater extends downstream of the seepages for fewer than 75 feet until the tidal influence of the Warwick River predominates (VDCR 1997). Vegetation includes lizard's tail (*Saururus cernuus*) and several species of fern. The seepage areas contain a leaf pack that is 1-2 centimeters (cm) thick, which is typical of other sites where the tidewater interstitial amphipod has been found in Virginia. The conservation planning boundary includes the two seepage areas where the tidewater interstitial amphipod was documented, an additional seepage area that contains potential habitat, and a buffer area where land use activities should be evaluated to determine their impacts on groundwater quality and rare amphipod occurrences.

Warwick River South Seeps. This 26-acre conservation area of forested hillsides and ravines occurs along the Warwick River near the JBLE-Eustis Youth Services Center. The tidewater interstitial amphipod was collected at six groundwater seepages in this area. All of the seepages appear to be perennial. Vegetation in the conservation area includes lizard's tail, false nettle, clearweed (*Pilea fontana*), jack-in-the-pulpit (*Arisaema triphyllum*), netted chain fern (*Woodwardia areolata*), sensitive fern, cinnamon fern (*Osmunda cinnamomea*), New York fern (*Thelypteris noveboracensis*), and cutgrass (*Leersia* spp.). The surrounding forest is dominated by red maple, yellow poplar, and sweetgum, with a few scattered loblolly pine trees present.

These seepages also contain a leaf pack of 1-2 cm in depth. This area has a history of disturbance from construction of facilities. The largest seepage area harboring the tidewater interstitial amphipod is adjacent to a buried, corrugated stormwater drainage pipe upslope of an associated concrete outfall structure. The conservation planning boundary for this area includes the six seepage areas and a buffer zone (USATCFE 1997). Since the original designation of the North and South Seeps, considerable changes to the adjacent landscape have occurred to include the installation of security fence which precluded monitoring of these habitats.

2.4 Mission and Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

Generally, natural resources do not preclude or eliminate accomplishing military missions at JBLE-Eustis. The key to reducing risks of major impacts on missions is effective planning, communication, and coordination. Nonetheless, some natural resources may pose constraints. However, with an understanding of the specific details in conjunction with proper planning and coordination, such constraints are minimal. The following constraints and their effects on the installation are noted.

Federally listed species (threatened or endangered). Currently, there are one terrestrial and one aquatic federally listed species associated with JBLE-Eustis as discussed in Sections [2.3.3](#) and [2.3.4](#) above with discussions on management practices in Section [7.4](#) (these species being the Northern long-eared bat (*Myotis septentrionalis*), and the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)).

This bat species was first documented on the installation during a bat survey conducted in 2016. Its impact on military missions is minimal. There are no restrictions on military training activities currently. However, timber harvests, tree removal (with some exceptions including removal of small shrubs, trees less than 3-inch DBH and trees identified as hazard trees by natural resources staff) and forest habitat conversions to impervious surface or non-forest habitat must be considered before executing related projects.

The Atlantic sturgeon is an aquatic organism and would not have any direct impact on military training or other missions occurring on land. There are no military watercraft operation restrictions in the James River or at 3d Port because of the sturgeon. Dredging of Skiffes Creek is periodic (typically every 5 years) and would require consultation with NOAA.

Stable shorelines to support the continued operation of buildings and other mission-critical infrastructure, as well as forest habitat to simulate operations in European and other temperate zone environments, is the resource requirement for the military mission that is most likely to be affected by climate change.

SLR and SS projections suggest key mission-related infrastructure on the installation may be at-risk due to inundation or SS. Most training areas at JBLE-Eustis could also be affected by SLR and SS. All training areas south of the golf course (17A-C, 18-24, 26, 28, and the installation's impact area) are projected to be inundated, while most training areas in the north would be

unaffected (except for training areas 14A-B and 27 which could be severely inundated). Due to these vulnerabilities, a near total and complete failure of all military operations is possible due to SLR and SS in the future.

The most significant climate change impact to the military mission, in terms of species and habitat, will most likely be the conversion of forest to shrub habitat due to inundation. Forest ecosystems found at JBLE-Eustis replicates European and other temperate zone environments which provide conditions for cover and concealment for soldiers/opposing forces conducting tactical training and land navigation. These training environments and scenarios are critical to the military mission JBLE-Eustis.

Wildfires at the installation are expected to increase slightly. This could have primary effects on the military mission such as damaging equipment and preventing personnel access to mission critical infrastructure. An increase in fire occurrence or magnitude could also have secondary effects on the mission such as habitat shifts leading to an increased regulatory environment.

Future impacts to the mission at JBLE-Eustis linked to climate change could include:

- increases in temperature and wind velocity leading to unsafe environmental conditions for the launch of current and planned weapons and equipment, resulting in increased maintenance requirements, requirements for new equipment, or decreased launch capacity (DoD, 2014).
- increased dust generation affecting equipment and visibility (DoD, 2014).
- increased wind velocities damaging vital mission infrastructure (Sydeman et al., 2014).
- increased drought potential (Glick, Stein, & Edelson, 2011).
- potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

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

2.4.2 Land Use

The installation is geographically divided by a drainageway into two areas: Main Installation (cantonment area) and Mulberry Island. Approximately 42 percent of the installation is used for outdoor military training. Approximately 222 acres in the cantonment area has been conveyed to a private development firm with a 75-year lease under the Residential Community Initiative (RCI) for military family housing and redevelopment.

The cantonment area includes administrative offices, community facilities, military family housing, barracks, limited industrial operations, closed landfills (Environmental Restoration Program [ERP] sites), Third Port, maintenance facilities, medical and dental clinics, research facilities, supply/storage areas, recreational facilities, and some of the installation's training areas. The Third Port is a 1,000-foot pier on the James River and serves as a major force deployment facility and deepwater port for the US Army and the 7th Transportation Brigade (Expeditionary), as well as the watercraft training platform for the Transportation School and the fixed base for the 7th Transportation Brigade (Expeditionary).

Mulberry Island includes the Pines Golf Course, Felker Army Airfield, several historical sites, the Range and Training Complex (which includes all firing ranges and most of the Training Areas) and the impact area (Table 2-6 and Table 2-7, respectively). The airfield is managed by the 1st Fighter Wing and includes aircraft operations and maintenance facilities, runways, aprons, helipads and taxiways for fixed-wing and rotary-wing aircraft. The Matthew Jones House (cantonment area) and the remains of Fort Crafford (in Training Area 28) are two historical sites listed on the National Register of Historic Places at JBLE-Eustis. Outdoor training land uses include the Range Complex facilities for bivouac, land navigation and tactical training. Most outdoor training lands are on Mulberry Island; however, nine training areas are in the cantonment area. Tables 2-6 and 2-7 presents the existing training areas and ranges on the installation. All total, there are six firing ranges and 25 training areas on JBLE-Eustis available for use throughout the year.

Improved grounds/land. These areas are occupied by buildings and other permanent structures, lawns, parade fields, 3d Port and athletic fields. This should include most of cantonment (including areas of BBC housing), Training Area 5, Training Area 15 (the hardstands and buildings), the new Aviation Complex, firing ranges and golf course (minus wetlands/forested areas). Collectively, this constitutes approximately 1,061 acres.

Semi-improved grounds/land. These areas involve periodic maintenance for operational requirements such as erosion control, bird control, visual clear zones, etc. For JBLE-Eustis this would include the mowed grass area around the Felker Airfield runway, picnic areas along the James River, Ammunition Supply Point (ASP), golf course forested/wetland areas, horse stable/pasture, Felker Airfield Clear Zone, Landfills 7 and 15, the two MOUT training facilities and dredge spoil facility. Collectively, this constitutes approximately 857 acres.

Unimproved grounds/land. These are areas that do not fall into the improved or semi-improved areas where natural vegetation grows without any maintenance. Such areas include forested areas, wetlands, lakes, ponds, vernal pools and open fields/early successional habitats. These areas constitute the remaining areas not associated with improved and semi-improved areas. Collectively, this constitutes approximately 5,954 acres.

Table 2-4. Ranges on JBLE-Eustis

Range	Designation	Acreage
1	Pistol Qualification Shotgun Familiarization	5.8
2	M16 and 25mm Qualification	3.4
¾	M16 Qualification, .50-cal w/ *SRTA ammunition, 9mm qualification	43.2
5	9 mm and .45-cal qualification	9.67
6	M203 Qualification, Helicopter Landing Tower Operations	16.26
	*AATD BTRACS Testing Range	3.5
14B	Hand Grenade Qualification	61.7

Table 2-4. Ranges on JBLE-Eustis

Range	Designation	Acreage
	Course-Non-Live Fire	

Source: USATCFE *AATD = Aviation Applied Technology Directorate, BTRACS = Ballistics Test Range, SRTA = Short Range Training Ammunition

Table 2-5. Training Areas on JBLE-Eustis

Training Area (Location)	Type of Area (Name)	Acreage
1 (Main Installation)	Tactical bivouac, land navigation, maneuver area/training light forces, vehicle access (Yorktown)	49.8
2 (Main Installation)	Tactical bivouac, land navigation, maneuver area/training light forces, vehicle access (Tiensen)	75.12
5 (Main Installation)	Vehicle staging, tactical operations center (TOC) (command/control), bivouac, material handling training (Cowpens)	5.1
6 (Main Installation)	Railcar loading, Vehicle and equipment storage (Hanks Yard)	12.6
7 (Main Installation)	Boy Scout camping (Chancellorsville)	14.2
8 (Main Installation)	Confidence course, small unit tactics. (Meuse-Argonne)	42.1
9 (Main Installation)	Aircraft mock-up, physical fitness, aircraft loading, and vehicle loading, material handling training (Tippecanoe)	7.7
14A (Mulberry Island)	Engagement Skills Trainer 2000, Vehicle staging area, Motorcycle training course, HMMWV Egress Assistance Trainer (HEAT) (Hue)	25.78
15 (Mulberry Island)	88H Material Handling Equipment Training (Normandy)	87.4
17A (Mulberry Island)	Tactical bivouac, small unit tactics (St. Michel)	88.1
17B (Mulberry Island)	Aviation flight operations and training, Reserve Component, Non-tactical bivouac (Fredericksburg)	258.9
17C (Mulberry Island)	Tactical bivouac, small unit tactics (Missionary Ridge)	87.8
18 (Mulberry Island)	Logistics Over the Shore (LOTS)/Tactical Operations Center, bivouac, material handling, small unit tactics, Reverse Osmosis	13.8

Table 2-5. Training Areas on JBLE-Eustis

Training Area (Location)	Type of Area (Name)	Acreage
	Water Purification Unit training (Anzio Beach)	
19 (Mulberry Island)	Tactical bivouac, small unit tactics	96.6
20 (Mulberry Island)	LOTS, cargo loading, Material Handling Equipment MHE Training (Quin Nhon)	11.6
21 (Mulberry Island)	Tactical bivouac (Antietam)	187.73
22 (Mulberry Island)	Tactical bivouac, Range Operations, land navigation, small unit tactics (Inchon)	50.3
23 (Mulberry Island)	Tactical bivouac, land navigation, maneuvering, vehicle parking, small unit tactics (Magruder Line)	616.4
24 (Mulberry Island)	Tactical bivouac, maneuvering, vehicle parking, land navigation, small unit tactics (Seoul)	603.6
26 (Mulberry Island)	NBC Chamber, tactical bivouac, leadership reaction course, land navigation, small unit tactics (Cold Harbor)	148.3
27 (Mulberry Island)	Landship & Crane, Terminal cargo handling, vessel management and operations (Third Port)	74.9
28 (Mulberry Island)	Helicopter VOR Sling-load Area, Tactical driver's training, Convoy Reaction Course, tactical bivouac, helicopter landing, small unit tactics (Junction City)	769.8
29 (Main Installation)	Railcar Loading Training Area, Material Handling Equipment MHE Training (Wonju)	35.4
30 (Main Installation)	Special operations, small unit tactics	64.49

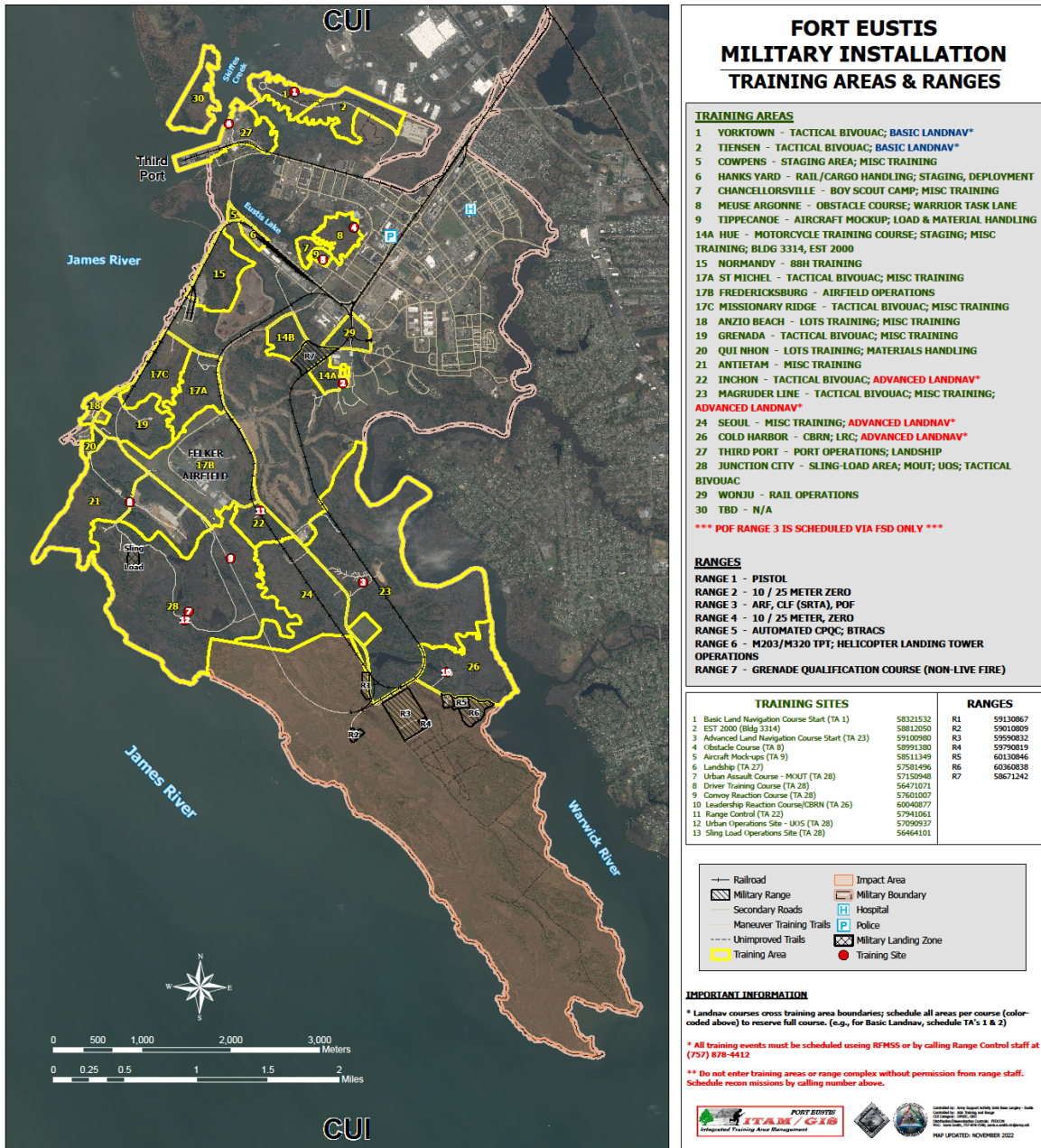


Figure 2-4. Ranges and Training Areas at JBLE- Eustis

2.4.3 *Current Major Mission Impacts on Natural Resources*

Currently, there are few impacts except construction that converts natural/vegetative communities into impervious surfaces. Training events have minimal impact in terms of movement by soldiers/military personnel through natural areas by foot (dismounted movement). Mounted/vehicular off-road movement when conducted avoids wetlands and most forested areas. Operation of tracked vehicles is generally limited except for bulldozers involved in shoreline logistical training (this is performed in accordance with regulatory permits when below mean high water). The existing firing ranges generally do not have major impacts except when operational uses cause a wildland fire. Occasionally, fallen timber or hazard trees (standing dead timber) are removed to accommodate movement or bivouac as well as safety in training areas (however, three to four 12 to 20-inch diameter logs per acre are retained as feasible).

Dredge spoils management. JBLE-Eustis operates a port facility for its military watercraft. Periodically the channel at 3d Port must be dredged to allow for vessel movement and overall port operations. environmental assessments for this operation have been prepared. Dredging may have impacts on some anadromous fish to include the endangered Atlantic sturgeon; however, Section 7 consultation under the Endangered Species Act with the National Oceanic and Atmospheric Administration (NOAA) and an environmental impact analysis would be required. Currently, dredge spoils are placed in the JBLE-Eustis Dredge Material Management Area (FEDMMA). The life cycle for the FEDMMA closes in the near future. Dredging requirements will generate the need to address future disposal in the form of a new facility, off-site disposal, or investigating uses for shoreline restoration and resiliency such as thin layering or backfilling breakwaters.

Warwick River dredging. Consideration to dredge areas of Warwick River in the vicinity of the Warwick Pier has been proposed. The full scope of the action has not been conveyed nor has the initiation of environmental impact assessment documentation. Consequently, it remains uncertain as to the impacts on natural resources at the time of this INRMP preparation. Potential issues include irreparable alteration of immediate installation shoreline and loss of natural areas for frequent placement of dredge material.

Runway Expansion. A proposal to extend the existing runway of Felker Army Airfield is being processed. The details on the scope of the action are not available at the time to of this INRMP preparation; however, permanent loss of wetlands acreage and some forested areas are expected. Additionally, there may be alteration of shoreline habitat along the James River. At the time of this INRMP, an Environmental Impact Statement (EIS) was under consideration.

Hazard trees/fallen timber. Storm events, biotic factors and human activities can lead to stress or the death of trees. In these cases, trees may become hazards to property and safety of personnel. In training areas, standing hazard trees are removed with a small portion left to serve as habitat/microhabitat for wildlife. Large numbers of fallen timber may occur in training areas to the extent that movement or use by military personnel becomes limited. Collectively, removal can be expensive depending on the volume.

Hazardous wildlife and zoonotic diseases. Wildlife in general do not represent actual constraints to military operations; however, certain conditions require consideration. Generally, most wildlife on the installation represent low risks as direct hazards to personnel when left alone. Certain mammalian species such as coyotes, red foxes, gray foxes, and raccoons can cause serious injury if cornered, harassed, or captured. Deer may pose risks via vehicular collisions. No venomous snakes have been documented to date by installation natural resources staff on JBLE-Eustis; however, the risk is not set at zero but is considered low. The more significant aspect concerns the risks of zoonotic diseases such as rabies and species serving as hosts or reservoirs for tick-borne diseases. Several cases of rabies in wildlife have been documented on JBLE-Eustis (raccoon, red fox, and opossum).

Environmental Restoration Program (ERP). A comprehensive program designed to address restoration of the environment affected by USAF activities. Under a Federal Facilities Agreement (FFA) with USEPA Region III ERP conducts remedial actions to address contamination and Long-Term Management of sites governed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as well as applicable Federal, State, local, and DOD requirements. The JBLE-Eustis ERP conducts remedial actions to achieve acceptable human health and ecological risk, as agreed to by the USAF, Virginia Department of Environmental Quality and EPA Region III. In 1994, JBLE-Eustis was listed on the National Priorities List (Superfund) as site ID VA6210020321. The ERP includes two program elements: Installation Restoration Program (IRP) and Military Munitions Response Program (MMRP).

Installation Restoration Program (IRP). The IRP addresses the identification, and investigation of releases, removal actions and remedial actions, or a combination of removal and remedial actions to address:

- The release or substantial threat of release of hazardous substances or any pollutant or contaminant that may present an imminent and substantial danger to the public health or welfare.
- Long-term cleanup of petroleum, oil, and lubricants (POLs); hazardous wastes and hazardous waste constituents.
- Explosive compounds released to soil, surface, water, sediments, or groundwater as a result of ammunition or explosives production or manufacturing at ammunition plants, which are not defense sites, and therefore, are ineligible for cleanup under the MMRP.

Military Munitions Response Program (MMRP). The MMRP pertains to munitions response actions that address unexploded explosive ordnance (UXOs), discarded military munitions (DMMs), or munitions constituents (MCs) at defense sites. Defense sites exclude operational ranges, operating storage or manufacturing facilities, or facilities that are used for or were permitted for the treatment or disposal of military munitions, and locations outside of the United States.

Emerging Contaminants. Per-and Polyfluoroalkyl Substances (PFAS) is a group of synthetic fluorinated organic compounds used in many industrial and consumer products, including nonstick cookware, waterproof fabric, some food packaging, and the firefighting agent Aqueous Film

Forming Foam (AFFF) that are included in the IRP. PFAS compounds are classified as an emerging contaminant due to a reasonable pathway to contaminate drinking water sources, unacceptable risk to human and ecological health, and regulatory standards are evolving.

Figure 8 articulates locations of ERP sites.

DRAFT

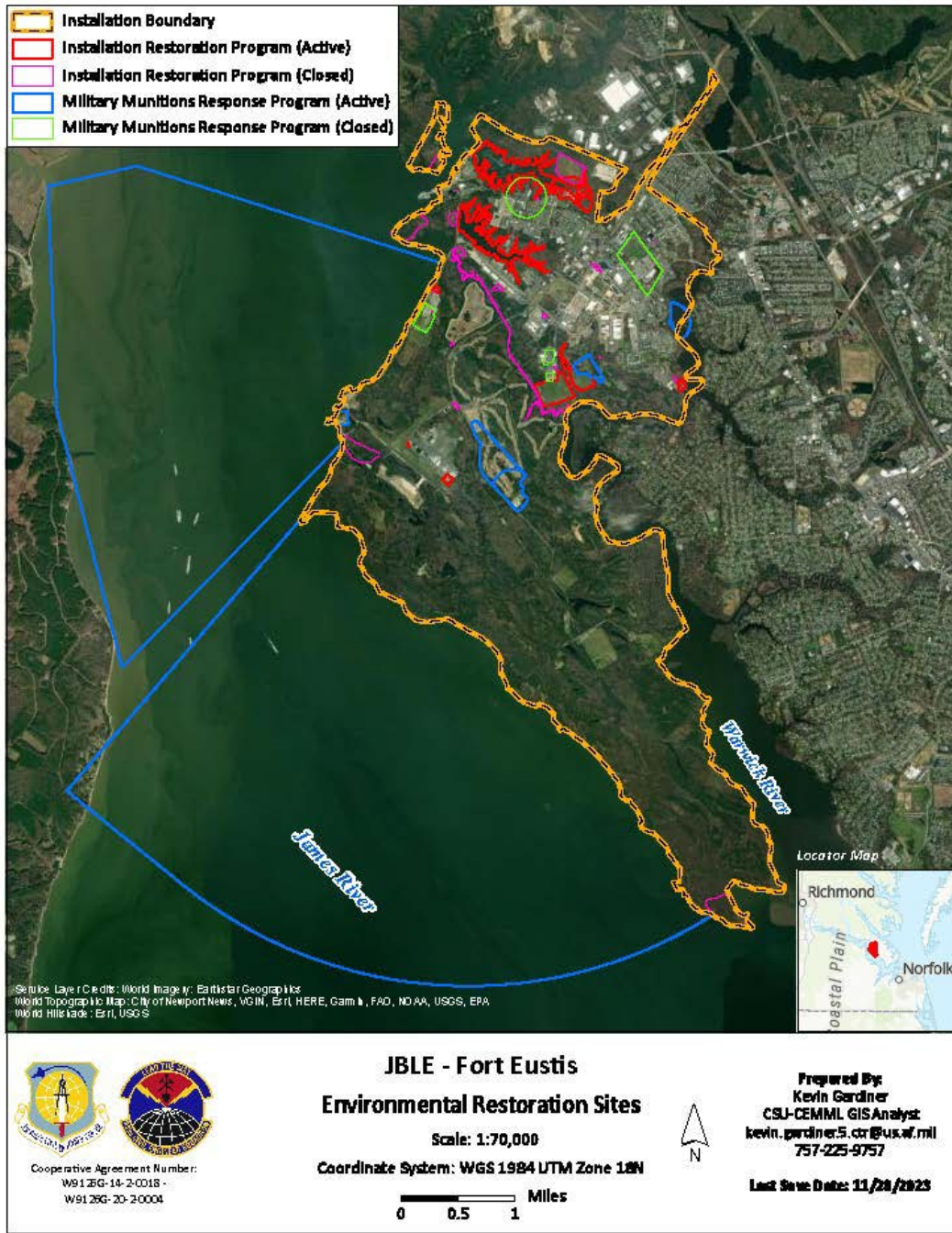


Figure 2.5. Environmental Restoration Sites on JBLE-Eustis.

Potential Future Mission Impacts on Natural Resources

Dredge spoils management. JBLE-Eustis operates a port facility for its military watercraft. Periodically (usually every 5 years) the channel at 3d Port must be dredged to allow for vessel movement and overall port operations. Environmental assessments for this operation have been prepared. Dredging may have impact on some anadromous fish to include the endangered Atlantic sturgeon; however, Section 7 consultation under the Endangered Species Act with the National Oceanic and Atmospheric Administration (NOAA) and an environmental impact analysis would be required. Currently, dredge spoils are placed in the JBLE-Eustis Dredge Material Management Area (FEDMMA). The life cycle for the FEDMMA closes in the near future. Dredging requirements will generate the need to address future disposal in the form of a new facility or off-site disposal.

Vegetation management at airfield clearance at Felker Army Airfield. The purpose of this action is to attain and maintain vegetation clearances within the Primary Surface, the Clear Zone, and the Approach-Departure Clearance Surface Area adjacent to the Clear Zone at the Felker Army Airfield to provide the adequate margins of safety for aircraft take-offs and landings in accordance with the UFC 3-260-01 to the maximum, practical extent. An environmental assessment was completed in 2018. Based the chosen alternative, an estimated 20 acres of forested wetland and an estimated 100 acres of upland forest would be permanently lost. Additionally non-forested wetlands may be impacted.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and its Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13834, *Efficient Federal Operations*; DoDI 4715.17, *Environmental Management Systems*; AFI 32-7001, *Environmental Management*; and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems—Requirements with guidance for use*, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

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

4.0 GENERAL ROLES AND RESPONSIBILITIES

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

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	Installation Role/Responsibility Description
Installation Commander	Coordinate with CES/Environmental Element (CEIE) regarding natural resources issues affecting missions. This includes but not necessarily limited to hazard trees/limbs, tree removal, nuisance/hazardous wildlife, arthropod pests, alteration of existing land/habitat conditions, and alteration of surface water, wetland, or groundwater conditions.
AFCEC Natural Resources Media Manager/ Subject Matter Expert/Subject Matter Specialist	Advises installation natural resources staff on new conservation laws and regulations. Supports/processes installation project funding requests.
Installation Natural Resources Manager/Point of Contact	Oversees all matters related to natural resources management. Prepares, executes and manages the JBLE-Eustis Integrated Natural Resources Management Plan (INRMP).
Installation Unit Environmental Coordinators (see Air Force Instruction 32-7001 for role description)	Ensure personnel comply with the INRMP and JBLEI32-102.
Range Operating Agency	Manages training areas and weapons ranges.
Conservation Law Enforcement Officer (CLEO)	Performed by permanent USFWS officers assigned to JBLE-Eustis enforcing federal and state wildlife and habitat laws and regulations.
National Environmental Policy Act /Environmental Impact Analysis Process Manager	Addresses projects/actions to the Installation Natural Resources Manager and IPMC for review in the EIAP.
National Oceanic and Atmospheric Administration, National Marine Fisheries Service	Provides information on fisheries and respective federally listed species.
United States Department of Agriculture, Forest Service	Provides BASH support at Felker Army Airfield through 1 st Fighter Wing and nuisance wildlife management for the Installation Natural Resources Manager when contract issued.
United States Fish and Wildlife Service	Provides CLE support and consultation support to JBLE-Eustis INRMP preparation.

JBLE-Eustis Staff	Responsibilities
Installation Commander (633 ABW/CC)	Approves and signs the INRMP (unless delegated to 733 Mission Support Group Commander). Certifies the INRMP Annual Review Summaries (unless delegated to 733 Mission Support Group Commander).
Commander, 733 Mission Support Group (MSG)/CC.	Directs the overall management of base operations and facilities to include controlling access to and use of installation natural resources. Approves and signs the INRMP and INRMP Annual Review Summaries (currently delegated to 733 Mission Support Group Commander).
733 Civil Engineer Squadron (CES) Director/Base Civil Engineer (BCE).	<ul style="list-style-type: none"> • Incorporates natural resources management into master planning. • Serves as the applicant/permittee for all wetland, subaqueous land, primary sand dunes, and stream permits issued as applicable by US Army Corps of Engineers (USACE), Virginia Department of Environmental Quality (VDEQ), Virginia Marine Resources Commission (VMRC) and City of Newport News Wetland Board.
Chief, Fire and Emergency Services (733 CES).	<ul style="list-style-type: none"> • Responds to wildfires. • Approves prescription fires.
Chief, Environmental Element (733 CES).	Has overall management responsibility for all natural resources on JBLE-Eustis property. Supervises Installation Natural Resources Manager & related staff.
Team Lead, Natural Resources & Integrated Pest Management Team, Environmental Element (733 CES).	<ul style="list-style-type: none"> • Serves as the natural resources program manager for the installation. • Prepares, reviews and implements the INRMP. • Prepares, reviews, and implements supporting natural resources-related plans. • Prepares INRMP Annual Review Summaries. • Manages for biodiversity. • Manages habitats. • Manages the Wildland Fire Management Program (prepares WFMP, plans prescription fires).

	<ul style="list-style-type: none"> • Reviews natural resource issues during the Environmental Impact Analysis Program (EIAP). • Manages commercial timber to include preparing a forest inventory plan, performing timber cruises/assessments, coordinating timber harvests/sales and forest rehabilitation/regeneration. • Oversees invasive vertebrate & plant/vegetation species management. • Oversees wetlands management and permitting.
Wildlife Biologist	<ul style="list-style-type: none"> • Manages the hunting and fishing program as directed by JBLEI 32-102. • Manages game and non-game wildlife, and other fauna populations to include responding to hazardous or nuisance wildlife. • Oversees threatened and endangered wildlife programs. • Executes wildlife surveys.
Installation Pest Management Coordinator	<p>Oversees the installation integrated pest management program. Prepares, executes, and manages the JBLE-Eustis Integrated Pest Management Plan. Cross references the IPMP with the INRMP. Serves as the invertebrate fauna biologist incorporating related data into natural resources management. Oversees invasive invertebrate species management. Implements and manages a forest entomology program.</p>
Force Support Squadron (FSS) Director.	<p>Manages outdoor recreation facilities (excluding hunting and fishing resources).</p>
733 Security Forces Squadron (SFS)/CC.	<ul style="list-style-type: none"> • Performs euthanasia of injured/sick deer in coordination with the Installation Natural Resources Manager. • Assists USFWS CLEOs where feasible.

5.0 TRAINING

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

Installation Training

Various sources for natural resources staff training exist such as The Wildlife Society, Society of American Foresters, and the U.S. Fish and Wildlife Service National Conservation Training Center (amongst many other sources). However, funding for training/related professional development is generally not available except in very special cases where a specific requirement exists. Some training opportunities exist during the National Military Fish and Wildlife Association annual conferences when funding is available for installation staff to attend. Consequently, professional development of installation natural resources staff is generally not available.

NRMs at Category I installations must take the course DoD Natural Resources Compliance, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval Civil Engineer Corps Officers School (CECOS). See <http://www.netc.navy.mil/centers/csfe/cecos/> for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the USAF Institute of Technology (<http://www.afit.edu>), the National Conservation Training Center managed by the USFWS (<https://www.fws.gov/program/national-conservation-training-center>), and the Bureau of Land Management Training Center (<https://www.blm.gov/office/national-training-center>).

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

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

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

Several other plans are housed in the Natural Resources Office that include the Integrated Pest Management Plan, Wildland Fire Management Plan, and JBLEI 32-102. The natural resources team is also involved in BASH annual reports and record keeping.

6.2 Reporting

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

JBLE-Eustis Natural Resources Office has requirements to report Virginia DWR kill permits, harvest data, USFWS migratory bird permits, and eagle depredation permits.

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

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

Installation natural resources management is directed by CEIE and includes the program components outlined herein. The natural resources program includes commercial forest management; urban forestry; wildlife, fisheries, and habitat management; protection of threatened and endangered species; wetland management, and protection and management of conservation areas. Natural resources management is integrated into all projects, activities, and training and other events. CEIE integrates information from the program components with riparian, wetland, and water resource buffer zones; stream corridors; ecological communities; wetlands; threatened and endangered species; and locations of cultural and archeological sites to avoid impacts to sensitive resources.

Ecosystem management recognizes that humans are ecosystem components, and that sustainable human activity does not mutually exclude the preservation or enhancement of ecological integrity. Ecosystem management provides the installation the collective means to protect biodiversity and provide for military readiness.

Ecosystem management is preservation and enhancing ecosystem integrity. Over the long term, this approach maintains and improves the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies and communities.

The specific principles and guidelines that DoD has identified to achieve this goal are:

- Maintain and improve the sustainability and native biodiversity of ecosystems.
- Administer the program with consideration of ecological units and time frames.
- Support sustainable human activities.
- Develop a vision of ecosystem health.
- Develop priorities and reconcile conflicts.
- Develop coordinated approaches to work toward ecosystem health.
- Rely on the best science and data available.
- Use benchmarks to monitor and evaluate outcomes.
- Use adaptive management.
- Implement actions through installation plans and programs.
- Utilize disturbed, non-natural areas before converting natural areas to impervious surfaces/structures.

This INRMP implements ecosystem management by considering ecosystem management principles and guidelines in DODI 4715.03 Natural Resources Conservation Program and Air Force Principles for Ecosystem Management provided by AFCEC and AFMN 32-7003. This is accomplished by:

- Maintaining or improving existing natural areas in a sustainable manner that integrates biodiversity with military missions.
- Maintaining hydrological processes in tidal wetlands and creeks.
- Protecting the installation floodplain by avoiding construction of impervious surfaces in this area.
- Managing wetlands by type to support military operations where feasible.
- Avoiding training land losses.
- Rotating training land use to schedule managed timber harvests with follow-on habitat rehabilitation (such as re-planting trees, invasive vegetation control, etc.).
- Seeking partnership opportunities among installation tenant activities and with other DOD organizations, other federal agencies, state agencies and non-profit organizations that mutually support natural resource sustainment and supports military missions.

Overall land management at JBLE-Eustis is the responsibility of 733 CES. The land management program supports the military mission, protects environmental quality, and supports range sustainability. Management concerns include erosion and sediment control, stormwater management, nonpoint-source pollution, wetlands, coastal zone management, environmental restoration program support, shoreline management, and grounds and landscape management. Other initiatives include reviewing preconstruction plans for proposed projects, conducting periodic site inspections for erosion and sedimentation control needs, participating in the

Environmental Impact Analysis Program (EIAP) review process, preparation of Federal Consistency Determinations (where appropriate) and using native plant species for landscaping when feasible.

7.1 Fish and Wildlife Management

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

An important function of the natural resources program is to maintain sustainable wildlife, fish, and other fauna populations and enhance habitats to support a diversity of native species. Controlled harvest of game species and habitat manipulation are the primary methods used to manage game wildlife and fisheries on JBLE-Eustis. White-tailed deer and wild turkey comprise the big game species hunted on JBLE-Eustis while small game includes gray squirrel, cottontail rabbits, and migratory waterfowl. Non-game wildlife include those animal species not typically hunted as well as federally and state listed species. Other fauna include various invertebrate animal species.

Fish and wildlife management on JBLE-Eustis will change in response to climate change. Fish and wildlife management on JBLE-Eustis is currently heavily focused on population control of deer and furbearers. Projections suggest much of the habitat that currently supports those species will no longer be capable of supporting them by 2035, except for beavers, otters, and muskrats. As the southern portions of the installation become unsuitable for many terrestrial species, they will likely move north into more urbanized habitat and will potentially increase bird/wildlife aircraft strike hazard (BASH) concerns. Routine surveys will be necessary to determine which fish and wildlife species are inhabiting the changing landscape in the southern portion of JBLE-Eustis, and management practices will need to adapt to those changing conditions.

Freshwater habitat management should focus on removal of non-native aquatic plants and algae as well as reducing nutrient rich run-off into water supplies to help maintain stable dissolved oxygen levels, which will reduce the chances of algal blooms. Providing shade through planting of trees around water sources will help to prevent excessive increases in water temperature (Poff, Brinson, & Day, 2002).

Whitetail deer (*Odocoileus virginianus*).

Importance of deer management. This species is common on the installation and consequently, its relationship to the mission is of special concern. Whitetail deer management is the top wildlife management priority for JBLE-Eustis because of four primary impacts on the military mission. The population must be maintained at appropriate carrying capacities to (1) support a viable recreational hunting program for the installation community, (2) reduce risks of vehicular collisions, (3) reduce risks of tick-borne diseases, and (4) avoids habitat degradation from over browse of vegetation. Deer have been hunted on JBLE-Eustis since World War II. Annual records have been kept since 1968.

Historical management insight. Effective deer management did not exist until 1998 based on reorganization of a natural resources and pest management staff in FY 1995. Although recreational hunting occurred since 1961, data collection consisted of sex and antler points prior to 1998. During this time period, age was not determined and thus the data could not be analyzed. In August 1998, an Abysmal Parasite Count study revealed that parasite levels exceeded expected values suggesting the deer population exceeded the installation carrying capacity. Subsequent deer management was necessary to reduce the overall population. However, proactive measures were not implemented to force the reduction probably due to the lack of doe harvests in the past, and thus the population was only stabilized. In 2002, proactive measures were implemented to reduce the population. During 2001-2005, average annual doe harvest was approximately 38% higher than previous years. The steady increased harvest of doe caused the lowest doe harvest in recorded history at 21. During the fall of 2006, Hemorrhagic Disease was observed in the population with an estimated 60 animals affected. The deer population remained in a reduction management until 2016 when survey data indicated the female segment of the population was reduced and doe harvested were limited. Doe harvest was limited again in 2017 and was eventually eliminated prior to the conclusion of the 2017 recreational season. Low doe sightings with a significantly reduced fawn harvest, coupled with coyotes and numerous fawn carcasses found prior to the commencement of the recreational deer season triggered the elimination of antlerless deer harvests. For the first time in recorded history, the JBLE-Eustis deer population was placed under population increase status. The cantonment will always have a limitless doe harvest due to refugia occurring in locations where hunting is prohibited. Depredation events will continue in areas where hunting is prohibited, and deer densities increase and cause a rise in vehicular collision incidents. For the next few years, the goal is to maintain the deer population at current levels.

Management program for the INRMP period. The 2023 pre-season estimate is 500 deer based on population reconstruction techniques. However, this estimate does not consider predator depredation of fawns which makes the estimation difficult.

Goal for the INRMP period. The deer population goal for this INRMP period is to achieve a population number that is (1) below the biological carrying capacity on Mulberry Island (south of Milstead Island Creek), (2) below the cultural carrying capacity in the urban areas of the installation (north of Milstead Island Creek), and to (3) balance the ability of the deer population to support hunter interest towards maintaining an effective hunting program that serves as the primary tool for deer population control.

- Recreational hunting via archery in urban areas (north of Milstead Island Creek) continues to harvest all deer (antlered and antlerless).
- Biological data is collected and analyzed each season throughout the INRMP period.
- Continue coyote control during the INRMP period to the extent practical.

Biological carrying capacity is defined as the ability of the environment to sustain a wildlife population without detrimental effect to the environment or the wildlife species. Cultural carrying capacity is defined as the population level (as a threshold or density) of a wildlife species to which human attitudes are positive without negative impacts to human activities.

Wild turkey (*Meleagris gallopavo silvestris*). The eastern wild turkey became established on the installation following successful reintroduction efforts in 1999. At that time 24 adult birds were released. Populations increased to sustainable levels allowing a limited spring season of male turkeys by lottery beginning in 2005. Numbers of male turkeys available for harvest is determined each year following fall and winter surveys and spring gobbling surveys. The allowable number of male turkeys for harvest ranges from 3-13. The largest harvest occurred in 2007 with 6 of 9 allowable male turkeys being harvested. The turkey population was estimated to be approximately 200-250 birds in 2008 based on available resources and habitat. Turkey hunting was suspended in 2013 as population numbers appeared to be low. This situation was possibly due to dismantled training disrupting nesting and/or coyote depredation. The hunting continued in 2014. However, the turkey population was estimated at 150 birds in 2017. This number is estimated due to lack of resources to build a reliable survey.

The monitoring of turkey populations by field surveys and observations by the CEIE biologists is crucial due to limited habitat. In addition to limited resources, nest predation by mammals and reptiles constitutes the primary source of mortality. Limited habitat and nest predation affect bobwhite quail also.

Small game species. Typical small game species hunted on JBLE-Eustis include eastern cottontail rabbit, eastern gray squirrel, mourning dove, woodcock, and migratory waterfowl. Red fox, raccoon, gray fox, opossum, and coyote comprise furbearer species that may be hunted IAW VDWR regulations, the JBLE-Eustis INRMP, and JBLE I 32-102. Extremely low bobwhite quail numbers have precluded hunting of this species and is expected to remain so during this INRMP period.

Furbearer species. The goal of furbearer management is to reduce or eliminate nuisance populations in a manner consistent with land use and training objectives and to ensure that sustainable populations exist for their ecological values. Furbearer species on JBLE-Eustis include beaver, raccoon, muskrat, otter, grey fox, red fox and coyotes. Some of the furbearers will fall under predator management.

The need to trap nuisance wildlife is assessed on a case-by-case basis and animals are removed by the CEIE wildlife biologist and installation pest management personnel under permit. Additional technical assistance on nuisance animal control is obtained by CEIE from USDA, Animal Damage Control-Wildlife Services (ADC-WS).

Nongame Species. Effective management of nongame wildlife and other fauna contributes biodiversity and healthy habitats. Nongame wildlife habitat enhancement shall be integrated with forest management to promote a diversity of age structures and retain snags and active den trees to increase habitat complexity and biodiversity. Forest management tools used to promote diversity include TSI, prescribed burning, and regeneration cuts. CEIE will establish permanent survey points to monitor avian populations.

Fisheries management. The goal of fisheries management at JBLE-Eustis is to maintain a balanced and diverse aquatic ecosystem, which in turn provides sustainable freshwater recreational fishing opportunities. Fishing opportunities on the installation are limited to Eustis Lake, Browns

Lake, the James River along Harrison Road, and the Warwick River pier. Fishing at Eustis Lake and Browns Lake is catch and release only.

Management of habitat and microhabitat for wildlife. Effective wildlife management is dependent on good habitat and microhabitat management.

- Rehabilitation of degraded areas. Converting or rehabilitating degraded areas to natural conditions benefits biodiversity and contributes to land sustainability. There are numerous locations on the installation where the ground cover has been degraded by various activities. Restoring the vegetation on these sites reduces erosion, enhances wildlife habitat values in the immediate area, improve diversity on the installation, and restore conditions suitable for training.
- Habitat diversity. Habitat diversity is crucial to ecosystem-based management. Quality and diversity of grasslands, meadows, early successional habitat, young forests, and forests of varying age is vital to sustaining wildlife and military training. These habitat types can be created and maintained through forestry operations such as clearcutting, TSI, and maintaining areas already in early successional stages. The desired ratio is 1 acre of early successional habitat (that includes grasslands and meadows) to 10 acres of forest. Many tools such as prescribed fire and fertilization of native vegetation can be used to maintain these areas and prevent degradation by encroachment of non-native species such as Chinese lespedeza, Johnson grass, Bermuda grass and fescue.
- Managing edge habitat. Edge habitat occurs wherever two different plant communities or successional stages meet. Maintaining edge habitat is one means of enhancing biological and structural diversity on JBLE-Eustis. Wildlife species richness in edges is typically higher than in surrounding areas as a result of the increased plant and habitat diversity. Many bird species are attracted to edge habitats because of the greater structural diversity found there; preference for edge habitat by game species is due to the close association of cover and foraging areas. For some species such as bobwhite quail, soft edge is critical to long-term sustainment.
- Snags and cavity trees. Dead and dying trees (otherwise referred to as “snags”) and live trees with natural cavities are important microhabitat components within habitats for many wildlife species. Snags and cavity trees provide foraging, nesting, roosting, and perching sites. The abundance of woodpeckers, raptors, passerines, small mammals, and bats in an area is often directly related to the availability of snags and tree cavities. All snags within 100 yards of lakes and ponds on JBLE-Eustis, consistent with personal safety and the protection of facilities, will be retained for wildlife values. Similarly, all snags, active den trees, and active raptor nest trees will be retained during timber harvest operations.
- Artificial cavities or nest boxes. Artificial cavities or nest boxes have been used on JBLE-Eustis in areas where snags are limited or nonexistent. Originally, 25 wood duck, 10 bluebird and 2 bat boxes were installed. Currently, there are 4 wood duck nest boxes in close proximity to open water habitats. There were 7 eastern bluebird nest boxes installed on the closed landfills. One bat box has been installed. A more thorough survey of existing

artificial nest boxes shall be performed and monitored annually. Additional nest boxes/bat boxes will be installed.

- Retention of logs. Where feasible, 3-4 logs of approximately 12-inch to 20-inch diameter by approximately 12 to 20-foot length, per acre are retained. This is the objective for forest land habitat to increase microhabitat for wildlife.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

The outdoor recreation program, administered by 733 FSS and is intended to provide military personnel, military/civilian retirees, federal employees, and the general public with opportunities to participate in enjoyable outdoor activities that are compatible with the military mission. All recreational activities must be consistent with the INRMP, compatible with the military mission, and do not exceed the recreational carrying capacity of the land and associated natural resources. The outdoor recreation program includes many activities that fall into three categories: developed recreation areas, dispersed recreation areas, and special interest areas. Developed recreation areas are intended to accommodate intensive, congested activities. Dispersed recreation areas are those areas that can offer less intensive and non-congested activities. Special interest areas contain valuable resources such as archaeological or natural resources and requires limited, non-intensive use.

Developed recreation areas at JBLE-Eustis include:

- Sports/athletic fields.
- Jogging/walking trail (Mulberry Island Road and Wilson Avenue).
- Mini-Park (batting cages, putt-putt golf).
- The Pines Golf Course.
- Go-Kart Track.
- Privately-Owned Weapon Range (at Range 3).
- Horse-back riding (restricted to existing road networks).
- Warwick Pier (boat launch and fishing).
- MWR Campground.
- Picnic areas (Harrison Road and Warwick Pier).

Dispersed recreation areas at JBLE-Eustis include:

- Hunting, fishing, and boating areas are articulated in JBLEI 32-102.
- Canoeing & kayaking (Eustis Lake, launch sites at Training Area 20, area immediate southwest of Training Area 18, and Warwick Pier).

Special interest recreation areas:

- JBLE-Eustis Nature Trail (hiking, wildlife watching).
- Bird watching point (of Goose Island cove at intersection of Harrison Road and Taylor Avenue).
- Matthew Jones House (educational tour scheduled through the CEIE archaeologist).

Maintaining a quality outdoor recreation program is dependent on proper management of the natural resources and efficient program administration and oversight.

Special restrictions with selected outdoor recreation activities:

1. Horse-back riding. Horseback riding is restricted to improved surface roads and the vicinity of the horse stables. This activity must refrain from impacting training areas and avoid wetlands and shorelines (such as the wetlands and shoreline along Harrison Road).
2. Fishing. Fishing in Eustis Lake and Browns Lake is strictly catch and release only regardless of fish species or size. All fish must be immediately released back into the either of the two lakes from which they were caught. There are no exceptions.
3. JBLE-Eustis Nature Trail. The JBLE-Eustis Nature Trail is specifically intended for walking, hiking and wildlife watching. All users of the trail network shall remain on the trail itself. Personnel are not permitted to move about the forested area and adjacent training area. Damaging trees by removing or cutting limbs, cutting, or painting root systems, or carving in the bark is strictly prohibited. Harassing, killing, capturing, or removing wildlife or other fauna is strictly prohibited. Collection of plants or animals is strictly prohibited. Jogging, formation runs, use of bicycles (such as mountain bikes), and use of motorized conveyances (including but not limited to vehicles, all-terrain vehicles, and motorcycles) are strictly prohibited.
4. Currently, there are no authorized recreational off-road vehicle or mountain bicycle areas.
5. New outdoor recreation opportunities. New opportunities may arise in the future. Such opportunities shall be articulated in a written proposed program with supporting maps and other information. The proponent shall prepare an AF Form 813 and submit the form with the supporting documentation to CEIE (and the weekly service and work order board). The natural resources staff within CEIE shall review and process the proposal to the Installation Commander (633 Air Base Wing Commander) if deemed compatible with the military mission, the INRMP, and the carrying capacity of the land.
6. All hunting and fishing activities conform to this INRMP and JBLEI 32-102. Outdoor recreation and public access to natural resources at JBLE-Eustis will likely be significantly impacted by climate change. While fishing opportunities will probably remain constant throughout the future, hunting is likely to be restricted as SLR and inundation reduce the number of game animals present and the amount of terrestrial habitat available for such activities. Golfing will continue to be possible in the near future, but the golf course is projected to be partially inundated by 2035, and almost completely inundated by 2065. Activities such as go karting, tennis, swimming, baseball, soccer, softball,

running and attending movie theaters and the recreation center will continue to be accessible as they are located in the northern ends of JBLE-Eustis where SLR and inundation will have minimal effects.

7.3 Conservation Law Enforcement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

The Sikes Act mandates that INRMPs address a means of enforcing applicable natural resources-related laws and regulations (16 USC 670a(b)(1)(H)). In 2017, the USAF and USFWS entered into an interagency agreement, Interagency Agreement between the United States Fish and Wildlife Service and the United States Air Force for the Conservation of Natural Resources on Air Force Controlled Lands establishing a cooperative relationship between the two agencies.

In December 2022, the 633d ABW Commander signed the Conservation Law Enforcement Program Operations Plan (CLEP-OP) along with USFWS authorities. In June 2023, USFWS Conservation Law Enforcement Officers (CLEO) began performing this service at JBLE (including both JBLE-Eustis and Langley). USFWS CLEOs protect against unauthorized habitat disturbance and damage, illegal wildlife harvests or impacts, trespassing, illegal removal or damage to archaeological resources, unauthorized removal (killing, capturing) of wildlife (or wildlife parts) and other fauna, harassment of wildlife, unauthorized removal or collection of plants including trees and forestry products, and unauthorized liberation of animals (wildlife, invertebrate fauna, exotic animals, and domestic animals).

733d CES is responsible for coordinating conservation law enforcement with the USFWS. Two USFWS Federal Wildlife Officers are assigned to JBLE through the program agreement cited above. Conservation law enforcement functions include (but not necessarily limited to) the Lacey Act (16 U.S.C. §§ 3371-78, 18 U.S.C. §§ 42-43), Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), Migratory Bird Hunting Stamp Act (16 U.S.C. §§ 718a-718k), Endangered Species Act (16 U.S.C. §§ 1531-1544), Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d), Archaeological Resources Protection Act (16 U.S.C. §§ 460aa-460mm), Assimilative Crimes Act (18 U.S.C. § 13); Hunting, Fishing, and Trapping on Military Reservations and Facilities (10 U.S.C. § 2671); entering military, naval, or Coast Guard property (18 U.S.C. § 1382), and other applicable statutes under 18 U.S.C., as well as Virginia hunting, fishing, and trapping regulations.

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

Applicability Statement

This section applies to USAF installations that have threatened and endangered species on USAF property. This section is applicable to this installation.

Program Overview/Current Management Practices

General. Section (7)(a)(1) of the Endangered Species Act (ESA) of 1973 (16 USC 1536(a)(1)) directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for species listed as Threatened or Endangered. The ESA requires federal agencies to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed species or result in the destruction or adverse modification of federally designated critical habitat. The ESA also requires federal agencies to confer with the USFWS or the NOAA, as appropriate, on any action that is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat.

Status of listed species on JBLE-Eustis. The Installation Commander and Natural Resource Managers develop and implement policies and strategies for maintaining viable native plant and animal populations and genetic variability, preserving functioning representations of ecosystems and biological communities, and integrating human activities with conservation goals. These tasks include management of federally listed species that occur on the installation. The American bald eagle was the last federally listed species on the installation (prior to its delisting in 2007) until 2016. Currently, there is on federally listed species known to occur on the installation and one that occurs in waters adjacent to the installation. Consequently, management techniques are implemented. One federally listed bat species is documented on JBLE-Eustis. This species is the Northern long-eared bat. The Atlantic sturgeon occurs in river systems adjacent to JBLE-Eustis.

Bald eagles are commonly observed at JBLE-Eustis. While this species is no longer subject the Endangered Species Act, it is afforded special protections under the Bald and Golden Eagle Protection Act. Natural resources staff perform annual bald eagle nest surveys using aerial platforms. Figure 7.1 articulates known active nests as of the date of this INRMP.



Figure 7-1. Known Bald Eagle Nests on JBLE-Eustis.

Management of the Atlantic sturgeon. This species is a large estuarine-dependent fish. It is a long-lived and anadromous species (adults spawn in freshwater habitats but migrate back to estuarine and marine habitats where they spend the majority of their lives. Spawning adults migrate upriver in spring, beginning in April-May in the mid-Atlantic region and those individuals occurring in aquatic habitats near JBLE-Eustis are considered components of the Chesapeake Bay Distinct Population Segment (DPS). This DPS is considered federally endangered as published in the Federal Register on April 6, 2012 (Federal Register/Vol. 77, No. 24/February 6, 2012). The Atlantic sturgeon occurs in waters adjacent to the installation primarily the James River and Skiffes Creek. Military operations on JBLE-Eustis proper would not be expected to have any direct impact on this species. However, potential impacts on the Atlantic sturgeon shall be considered through the EIAP for certain water-borne projects and operations including (but not necessarily limited to) watercraft operations, JLOTS/LOTS exercises, channel dredging, and 3d Port infrastructure maintenance.

Management of the Northern long-eared bat. A bat survey conducted in 2016 identified the federally listed Northern long-eared bat on the installation. The Northern long-eared bat was listed as federally threatened in the Federal Register on April 2, 2015 (80 FR17974)). Two male Northern long-eared bats were captured in mist nets (as well as being documented via acoustic analysis). The extent of occurrence on the installation of this species remains unknown. Consequently, all projects and operations consider this species during EIAP. The following actions represent management of this species in addition to those listed in the biological opinion and incidental take statement issued in March 2023:

- Reporting of any species of dead bats found by members of the installation community to the Natural Resources Manager.
- Requesting wildlife management support from the Natural Resources Manager in the event of human-wildlife bat issues/conflicts regarding any bat species.
- Conduct wildlife surveys that include bat surveys at least every 5 years unless funding can be obtained for more frequent surveys.
- Evaluate impacts of new military training smoke and obscurants beyond the current usage.
- Inspect buildings identified for demolition (or have been unused) for possible bat harborage.

Management of Eastern Black Rail. This species remains undocumented as of CY 2023. The following information suggests that viable populations are not likely to exist on JBLE-Eustis: (1) the species has never been documented during the 6 formal wildlife/bird surveys between 1997 and 2021, (2) a very large portion of marsh habitat at JBLE-Eustis contains invasive common reed which degrades or eliminates sufficient suitable habitat, (3) the overall acreage of the marsh habitat if not the installation acreage is small, and (4) the installation is virtually surrounded by open surface waters (James and Warwick Rivers) that lacks connectivity to marsh habitat on adjacent properties. However, a planning level survey to determine the absence or presence of the species is planned to occur during CY 2024 or 2025 between the period of 1 March and 31 July.

Candidate species. Species that are candidates for federal listing or are state listed as endangered, threatened, or of special concern are not protected under the ESA. However, because candidate species may be listed in the future, JBLE-Eustis natural resources staff monitors statuses of

candidate species and identifies potential issues. At a minimum, installation shall document the presence of a candidate if sufficient information exists to do and identify the distribution of such species on the installation to the extent practical. Currently, the monarch butterfly and the tri-colored bat are under consideration for listing and are documented at JBLE-Eustis.

Rusty patched bumblebee. This species was listed as federally endangered effective January 20, 2017 (Department of the Interior Fish and Wildlife Service, 50 CFR Part 17 [Docket No. FWS–R3–ES–2015–0112; 4500030113]. JBLE-Eustis has an extensive insect inventory but is limited in aphids. This species does occur in Virginia but its presence on the installation remains unknown due to limited regional distribution information. It does not appear in the USFWS IPaC system. However, the U.S. Air Force Pollinator Conservation Reference Guide (2017) suggests the possibility of occurring at JBLE-Eustis as discussed in Section 2.3.4. Consequently, survey work for the Rusty patched bumble bee is suggested especially regarding certain pest management work during habitat management. This species shall be included in HERT215331.

State Listed Species. During the bat survey in 2016 (and in several subsequent surveys), two state-endangered bat species, the little brown bat and the tri-colored bat were documented. Both species were added to the list of state endangered species on April 1, 2016. Management of these species follows the management practices for Northern Long-eared bat noted above.

Rare plants and animals. Rare plants and animals in Virginia have been designated as such by the VDCR-VDNH based on the number of individuals of a particular species that are estimated to occur within the state. Although the state rarity ranking itself does not mandate protection, JBLE-Eustis considers management of rare species and species of special concern to the extent practical. Currently, the hymenopteran *Orussus sayii* (a rare parasitoid wasp) and the lepidopteran *Satyrrium kingi* (considered rare in Virginia) have been documented. [Appendix E](#) provides a list of Special Status Faunal Species in Virginia.

Other fauna. Other fauna include various invertebrate taxa such as arthropods, mollusks, and annelids. Resources are needed to sustain invertebrate taxa. Forested land shall retain 3-4 logs of approximately 12-inch to 20-inch diameter by approximately 12 to 20-foot length per acre where feasible to support habitat/microhabitat for insects, spiders, centipedes, sow bugs, collembolans, proturans, and diplurans. Dead or dying trees shall remain standing as habitat/microhabitat for these and other invertebrates to serve as food sources for woodpeckers and other wildlife. Exceptions, however, must be made based on risks to personnel safety and property damage such as training areas. Leaf litter in forested areas shall remain undisturbed except as required to meet military training requirements. Early successional habitats shall be planted with native forbs and grasses to serve as food sources and refugia. Aquatic habitats (streams, wetlands, ephemeral pools) should contain native aquatic vegetation and natural benthic vegetation debris for those arthropods (and other invertebrates) having an aquatic life stage such as dragonflies, damselflies, some beetles, some hemipteran bugs, megalopterans, and certain arachnids. Various terrestrial and aquatic habitats are equally important to other arthropod and non-arthropod invertebrates such as gastropods, other mollusks, bryozoans, annelids, and crustaceans.

7.5 *Water Resource Protection*

Applicability Statement

This section applies to USAF installations that have water resources. This section is applicable to this installation.

Program Overview/Current Management Practices

Water resources are protected on JBLE-Eustis through recognition of special natural areas, application of buffer zones around significant resources, and implementation of regional management goals, and objectives as required by the Clean Water Act (CWA), Chesapeake Bay Preservation Act, and Coastal Zone Management Act. Several federal and state laws and regulations reinforce the ecological and human health importance of maintaining healthy water bodies at JBLE-Eustis. Federal Compliance with Pollution Control Standards (EO 12088) and the CWA require federal facilities to comply with all substantive and procedural requirements applicable to point and nonpoint sources of pollution. In accordance with these requirements, JBLE-Eustis must obtain all appropriate federal, state, interstate, and local certifications and permits required by point and nonpoint pollution control, groundwater protection, dredge and fill operations, and stormwater management programs for any action that may impact water quality. USACE permits are required under Section 10 of the Rivers and Harbors Act of 1899 prior to commencing any work or building any structures in a navigable water of the United States.

Conservation Area Management. The Warwick River North Seeps and Warwick River South Seeps conservation areas may contain the tidewater interstitial amphipod. Potential threats to this rare species include changes to the groundwater or seepage areas such as groundwater pollution, lowering of the water table, timber harvest, and land disturbance.

Chesapeake Bay Program. Executive Order 13508, Chesapeake Bay Protection and Restoration, dated May 12, 2009 (74 FR 23099, May 15, 2009), established a Federal Leadership Committee, chaired by EPA, and including senior representatives from the departments of Agriculture, Commerce, Defense, Homeland Security, Interior and Transportation. It directed these agencies to prepare and publish a strategy for coordinated implementation of existing programs and projects to guide efforts to protect and restore the Chesapeake Bay. All military installations in the Chesapeake Bay watershed, including JBLE-Eustis, participate in the DOD Chesapeake Bay Program Action Team. Although each installation conducts its own individual projects to benefit the Bay, the quarterly meetings serve as a forum for the representatives to share their ideas and pursue joint projects and funding.

The Chesapeake Bay Preservation Act (also known as The Bay Act) required the Virginia communities that border on the tidal portions of rivers (that drain into the Chesapeake Bay (Tidewater jurisdictions)) to institute water quality protection measures to improve the declining health of Bay and its tributaries. The goal was to plan for and manage the adverse environmental impacts of growth and development in a manner that balances the objectives of improved water quality and continued growth. Areas within the Chesapeake Bay watershed, on which land use

activities have the potential to impact the Bay, are designated as [Resource Protection Areas](#) (RPAs) or [Resource Management Areas](#) (RMAs).

JBLE-Eustis is required by the federal Coastal Zone Management Act to follow the Chesapeake Bay Preservation Act (Virginia Code §10.1-2100) to the maximum extent practicable. JBLE-Eustis established 100-foot upland buffers as the [Resource Protection Areas](#) at tidal creeks, streams and wetlands in conjunction with the 100-foot buffers established by the city of Newport News. The objective is to maintain these as vegetated with native vegetation to the greatest extent practical.

Water Quality Monitoring. Water quality monitoring on JBLE-Eustis is important from a natural resources perspective. JBLE-Eustis complies with a Virginia Pollutant Discharge Elimination System (VPDES) permit. This involves monitoring seven outfalls for contaminants at Eustis Lake and Browns Lake as well as other outfalls that discharge into the James and Warwick Rivers.

Riparian Buffers. Maintaining vegetated riparian buffers serves many important functions in protecting wetlands and water quality. Stabilizing stream banks and shorelines with vegetation will reduce erosion and sedimentation rates. In addition, riparian buffers are critical for dissipating stream energy associated with high water flows, filtering sediment and pollutants, improving floodwater retention and groundwater recharge, providing habitat for instream and upland species, and supporting biodiversity (USEPA 1993).

Pollutant Input Control. Pollutants adversely affect the health of water bodies by stressing fish and other aquatic organisms in the water column and in bottom sediments and lead to bioaccumulation and related food chain events. The establishment or enhancement of wetland vegetation in these areas would be helpful for reducing pollutant input to water bodies on the installation. Excess nutrients in water bodies may cause algal blooms, increase nuisance plant growth and odors, disrupt species diversity, reduce dissolved oxygen levels, and cause human health impacts. The most effective method of reducing pollutant levels in water bodies is to limit the use of these substances in the surrounding watershed, particularly in areas adjacent to the water body.

Erosion and Sedimentation. Regulation of erosion and sedimentation is provided by the [Virginia Erosion and Sediment Control Law](#) (Virginia Code §10.1-560). This law requires an erosion and sedimentation plan be written and approved for any land-disturbing activity equal to or exceeding 10,000 square feet in area. If a construction project is located within a Chesapeake Bay Preservation Area, an erosion and sedimentation control plan must be developed for disturbed areas greater than 2,500 square feet (VDCR 2003). Land-disturbing activities include, but are not limited to, clearing, grading, excavating, transporting, and filling of land. Regulated land-disturbing activities must comply with minimum standards outlined in the Virginia Erosion and Sediment Control Handbook (VDCR 1992).

Stormwater Management. JBLE-Eustis has a Stormwater Pollution Prevention Plan for management of stormwater runoff and pollution prevention. It identifies the locations of buildings in which regulated and nonregulated industrial activities occur, provides locations for all 144 stormwater outfalls, and describes local drainage patterns. Stormwater runoff is conveyed off

installation into the James River or Warwick River. Approximately 32 miles of stormwater infrastructure is available to collect and transport stormwater runoff from the cantonment area into nearby waterways.

Conservation Areas

Designation and protection of areas on DoD installations that warrant special conservation efforts are authorized in DOD Instruction 4715.03. Conservation areas include botanical areas, ecological reserve areas, geological areas, riparian areas, scenic areas, zoological areas, watchable wildlife areas, and traditional cultural places having officially recognized special qualities or attributes. Clearing or disturbance of the land in the conservation areas is restricted and requires prior coordination with USFWS and VDCR-VDNH.

Warwick River North Seeps. This 11-acre conservation area of forested hillsides and ravines occurs along the Warwick River. The tidewater interstitial amphipod (*Stygobromus araeus*), a federal species of concern and former Category 2 candidate, has been collected in two of the groundwater seepage habitats located in a ravine between the Warwick River and a residential area. Both seepages dry completely (or nearly so) in summer or early fall during years of below average precipitation. Freshwater extends downstream of the seepages for fewer than 75 feet until the tidal influence of the Warwick River predominates (VDCR 1997). Vegetation includes lizard's tail (*Saururus cernuus*) and several species of fern. The seepage areas contain a leaf pack that is 1-2 centimeters (cm) thick, which is typical of other sites where the tidewater interstitial amphipod has been found in Virginia. The conservation planning boundary includes the two seepage areas where the tidewater interstitial amphipod was documented, an additional seepage area that contains potential habitat, and a buffer area where land use activities should be evaluated to determine their impacts on groundwater quality and rare amphipod occurrences.

Warwick River South Seeps. This 26-acre conservation area of forested hillsides and ravines occurs along the Warwick River near the JBLE-Eustis Youth Services Center. The tidewater interstitial amphipod was collected at six groundwater seepages in this area. All of the seepages appear to be perennial. Vegetation in the conservation area includes lizard's tail, false nettle, clearweed (*Pilea fontana*), jack-in-the-pulpit (*Arisaema triphyllum*), netted chain fern (*Woodwardia areolata*), sensitive fern, cinnamon fern (*Osmunda cinnamomea*), New York fern (*Thelypteris noveboracensis*), and cutgrass (*Leersia* spp.). The surrounding forest is dominated by red maple, yellow poplar, and sweetgum, with a few scattered loblolly pine trees present. These seepages also contain a leaf pack of 1-2 cm in depth. This area has a history of disturbance from construction of facilities. The largest seepage area harboring the tidewater interstitial amphipod is adjacent to a buried, corrugated stormwater drainage pipe upslope of an associated concrete outfall structure. The conservation planning boundary for this area includes the six seepage areas and a buffer zone (USATCFE 1997).

7.6 *Wetland Protection*

Applicability Statement

This section applies to USAF installations that have existing wetlands on USAF property. This section is applicable to this installation.

Program Overview/Current Management Practices

Several federal and state laws and regulations reinforce the ecological and human health importance of maintaining healthy water bodies at JBLE-Eustis. Federal Compliance with Pollution Control Standards (EO 12088) and the CWA require federal facilities to comply with all substantive and procedural requirements applicable to point and nonpoint sources of pollution. In accordance with these requirements, JBLE-Eustis must obtain all appropriate federal, state, interstate, and local certifications and permits required by point and nonpoint pollution control, groundwater protection, dredge and fill operations, and stormwater management programs for any action that may impact water quality. USACE permits are required under Section 10 of the Rivers and Harbors Act of 1899 prior to commencing any work or building any structures in a navigable water of the United States.

Permitting. Under Section 404 of the CWA discharge of dredge and fill material into waters of the U. S., including wetlands is prohibited unless a permit is issued by the USACE [Norfolk District](#). However, state and local agencies may also have jurisdiction regarding impacts to wetlands. Such agencies include VMRC, VDEQ, Newport News Wetlands Board, and Virginia Institute of Marine Science (VIMS). Military construction, training and other activities that could potentially affect wetlands may require permits from these agencies.

Information on individual and state permit requirements and application procedures (including joint permit applications) is available on the VDEQ website at <https://www.deq.virginia.gov/permits/water/wetlands-streams-vwp>.

Permits are requested by submitting a Joint Permit Application coordinated through CEIE to the VMRC. This application process will result in either an individual or Nationwide/Regional permit issued by the USACE and separate permits by the state and local agencies as appropriate or denial of the permit(s). If permits are issued that encompass loss of wetlands, the installation works towards the goal of no net loss of wetlands as stated in the Cooperative Agreement Between DoD and Environmental Protection Agency Concerning Chesapeake Bay Activities, dated 20 April 1990, paragraph 7. This may require creation of in-kind wetlands at other locations on the installation, purchase of wetland mitigation bank credits or payment into the Virginia Aquatic Resources Trust Fund. Such projects that potentially or are known to impact wetlands require an environmental impact assessment in accordance with Title 32 of the Code of Federal Regulations Part 989.

Nationwide Permits (NWPs) may be used to streamline the permitting process for activities that would have minimal adverse effects on aquatic environments when applicable. Activities such as the maintenance of existing structures, residential construction, reshaping existing drainage

ditches, and recreational facilities that do not alter the existing landscape may be permitted under NWPs. The maximum acreage limits for most NWPs is 0.5 acre, though notification to the District Engineer for activities that result in the loss of greater than 0.1 acre of water of the US is required (67 FR 2080). If project impacts are expected to exceed these criteria, an individual permit must be sought. CEIE evaluates projects/actions that may impact wetlands to determine the type of permit required.

The [Virginia Water Protection Permit Program](#) (Virginia Administrative Code 25-210) requires additional state permits for any impacts to state waters and wetlands, including isolated wetlands. Activities requiring a permit include dredging, filling, or discharging any pollutant into or adjacent to surface waters, or otherwise altering the physical, chemical, or biological properties of surface waters, excavating in wetlands, or conducting any of the following activities in a wetland:

- Filling or dumping (to include vegetation debris such as from clearing and grubbing).
- Permanent flooding or impounding.
- New activities that cause significant alteration or degradation of existing wetland acreages or functions.

Environmental Impact Analysis Process (EIAP). All projects and activities shall be evaluated through the USAF EIAP to determine whether wetlands may be impacted. Permitting requirements will be identified through this process and coordinated through CEIE.

No Net Loss. JBLE-Eustis strives to achieve a goal of no net loss of values and functions of existing wetlands and will also take a progressive approach toward protecting existing wetlands and rehabilitating degraded wetlands. Military construction and other projects with the potential to disturb wetlands are reviewed individually regarding wetland impacts, and individual permits are sought as needed. Although permits may be obtained that allow for the filling of wetlands, in accordance with EO 11990, Protection of Wetlands, federal agencies may do so only after finding no practicable alternative. JBLE-Eustis policy is to first avoid impacts to wetlands/aquatic resources where practical. In situations where avoidance is not possible, means to minimize the impacts will be considered. When avoidance and minimization are not possible, mitigation in the form of compensatory mitigation must be met. Such mitigation is articulated as a mitigation plan with a Joint Permit Application. When wetland permitting is required, JBLE-Eustis may need to pursue wetland mitigation banking or the In-Lieu of Fee Fund (Virginia Aquatic Resources Trust Fund) as mitigation of wetland impacts because land availability is limited.

Ephemeral pools (also referred to as vernal pools). Wetlands and vernal pools are of critical importance to the protection and maintenance of living resources, quality of surface waters, and flood protection. While not protected by the USACE, they are protected by Virginia Code 9, VAC 25-210-10. Ephemeral pools lack many of the wetland indicators and therefore identification is often difficult, thus the need for delineation of these seasonal wetlands for proper classification. Ephemeral pools provide essential breeding, spawning, nesting, and wintering habitats for many wildlife species. Ephemeral pools are temporary bodies of water that do not support fish populations. Several amphibian species that are intolerant of fish predation on eggs and larvae are dependent on vernal pools for their survival. JBLE-Eustis is committed to protection of ephemeral pools for their importance in maintaining biodiversity in the area where feasible. JBLE-Eustis inventoried and characterized ephemeral pools existing on the installation in 2009 in order to aid in their management as well as evaluate their contribution to biodiversity and sustainability of natural resources. JBLE-Eustis contains an estimated 80 acres of vernal pools.

7.7 Grounds Maintenance

Applicability Statement

This section applies to USAF installations that perform ground maintenance activities that could impact natural resources. This section is applicable to this installation.

Program Overview/Current Management Practices

Grounds maintenance occurs on improved and semi-improved land use categories, usually under a service contract. Landscaped and natural areas enhance the quality of life, protect property value and provide necessary ecological and infrastructure services.

Landscaping. The 1994 Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds (60 Federal Register [FR] 40837) provides the primary guidance on landscaping requirements for federal properties. Greening the Government through Leadership in Environmental Management, Executive Order (EO) 13148, requires federal agencies to incorporate beneficial landscaping into landscaping programs, policies, and practices.

The term beneficial landscaping describes practices that integrate native vegetation and wildlife habitat into the landscape and minimize the adverse effects that landscaping has on the natural environment. Specific directives of the presidential memorandum are that, to the extent practicable, federal landscaping projects should:

- Use regionally native plants.
- Use construction practices that minimize adverse effects on the natural habitat.
- Reduce fertilizer and pesticide use.
- Use water-efficient practices.
- Create outdoor demonstration nursery to promote awareness of the environmental and economic benefits of beneficial landscaping.

The purpose of this guidance is to ensure that plants suited for the local site conditions are selected and the introduction of a potentially invasive species is avoided. Using native plants ensures compliance with EO 13112 (Invasive Species). Furthermore, a plant properly selected for the site conditions will require less intensive management, potentially reducing pesticide, fertilizer, and water usage. Other factors to consider when selecting plant material include rooting space, space for crown development, soil properties, tolerance for urban conditions, aesthetics, availability, quality, and expected maintenance. For more information about tree care, please visit the [International Society of Arboriculture](http://www.arborists.org/) (ISA) website.

General design, security issues, and standards are considered in the development of landscapes at JBLE-Eustis. Landscape improvements and modifications are designed to coordinate with the existing landscape patterns for consistency and unity. Providing for passive and active surveillance of perimeter and landscape areas is a primary consideration in plant selection and layout. Landscapes are installed to include opportunities for low impact development. These management strategies incorporate landscape design practices to reduce the volume of stormwater runoff and decentralize flows. Landscape design and installation are conducted in accordance with the American National Standards Institute (ANSI) for Nursery Stock (ANSI Z60.1) and Tree Care Operations (ANSI Z133.1).

Urban Forestry. Urban forestry is the art and science of managing trees and forests in an urban ecosystem and includes the cultivation of trees as individuals or non-commercial forest stands rather than as components of a commercial forest. The urban forest provides several benefits to the JBLE-Eustis community. The urban forest provides a home for wildlife and a place for military personnel and their families to recreate. Management activities are conducted in accordance with the DoD Urban Forestry Manual (DOD 1996).



Urban Forestry at JBLE-Eustis.

Inventory and Maintenance. These activities are conducted to determine program requirements and to minimize landscape maintenance whenever possible. General observations on species diversity (number of species present), regeneration (relative presence of young trees), age distribution (regeneration, immature, mature), and tree condition (excellent, good, fair, poor, dead, and hazard) are recorded during landscape inventories. Over time, hazard trees become identified whereby they result from age, environmental stressors (drought, prolonged elevated ambient temperatures, insect infestation, etc.) and anthropogenic stressors (caused by incorrect construction

practices, lack of drip lines, soil compaction, etc.). There are two elements that define a hazard tree in terms of threats to life and property: (1) there must be potential for tree failure and (2) the presence of someone or something of value. For a falling tree or falling parts of a tree to be a hazard, there must be a “target” (people, vehicles, structures, etc.) within striking distance. The overall tree condition is used to determine maintenance needs for removal or pruning. CEIE maintains a prioritized hazard tree list. Urban forest cover is estimated at 1,000 acres. An urban forest compartment map is found at Figure 7-2. This map is the most current information for this habitat but will undergo adjustment in 2024-2025.

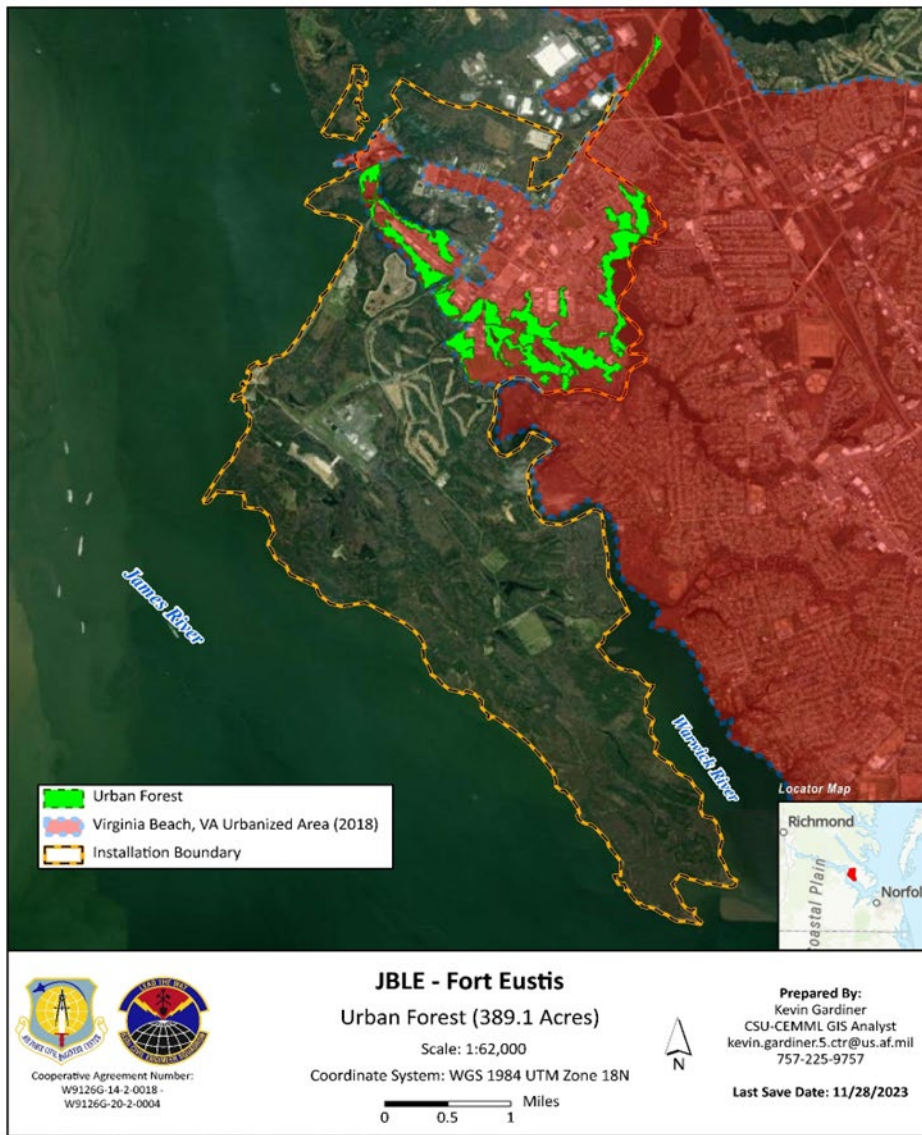


Figure 7-2. Urban Forests at JBLE-Eustis.

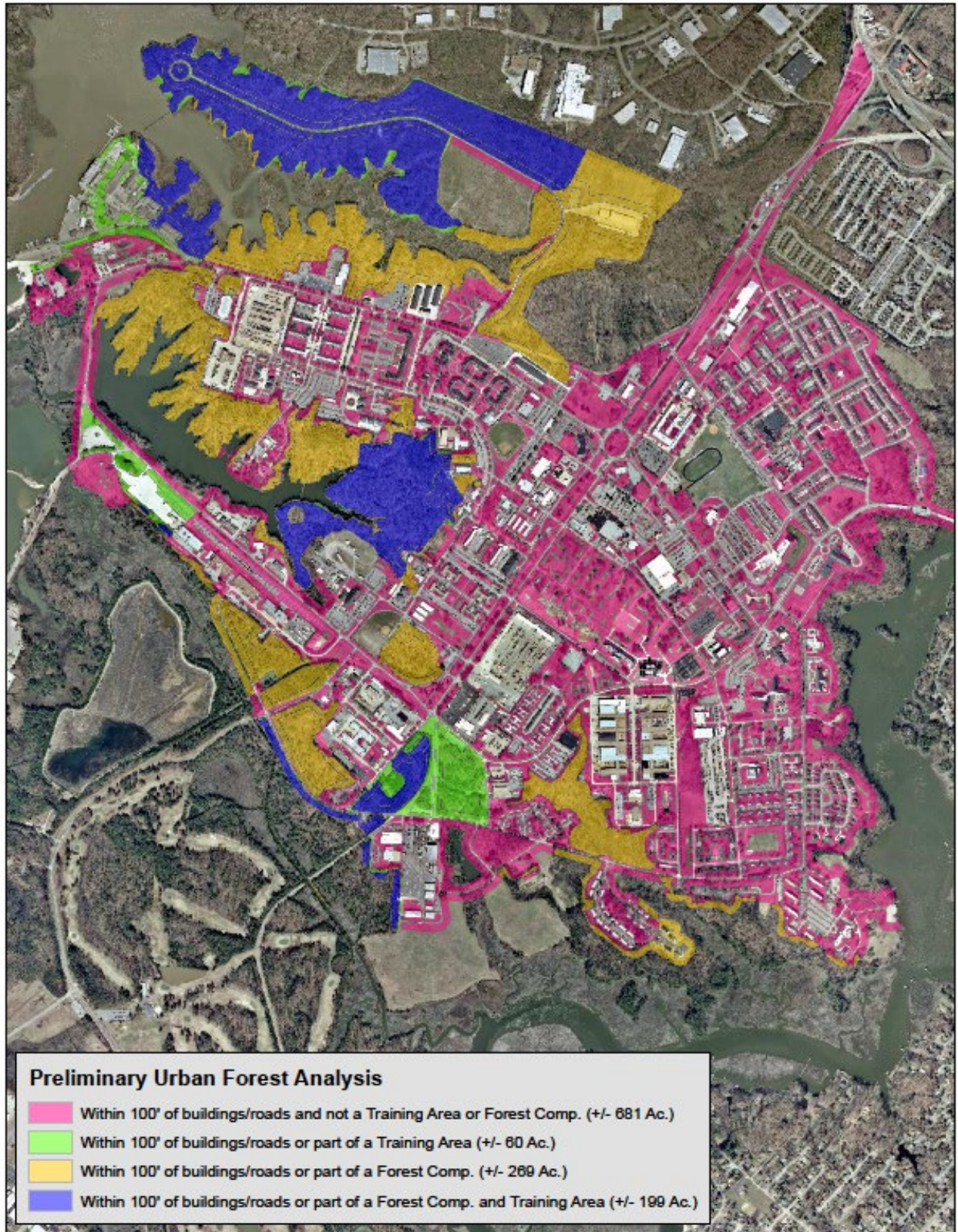


Figure 7-3. Urban forest compartments based on preliminary evaluation

7.7 Forest Management

Applicability Statement

This section applies to USAF installations that maintain forested land on USAF property. This section is applicable to this installation.

Program Overview/Current Management Practices

The first commercial timber harvest on JBLE-Eustis was conducted in 1951. While the installation is small in terms of acreage, military training has been a primary function where units rely on forested stands to achieve realistic training conditions. Consequently, maintaining forested stands has been difficult to perform. This is further exasperated by the lack of funds for reestablishing these habitats especially those that are forested wetlands.



Figure 7-4. Historical Timber Sale Units at JBLE-Eustis.

Forest inventories are the foundation of forest management. AFMAN 32-7003 requires installations with commercial forested land capable of producing more than 20 cubic feet/acre/year in wood biomass to maintain a forest inventory. Timber Inventory & Forest Management Plans were prepared in 1997, 2007, and most recently in 2021. Maps depicting commercial forest compartments are articulated in the 2021 Timber Inventory & Forest Management Plan. Implicit in the unique mission of JBLE-Eustis is the challenge of operating diverse air and ground training activities that are compatible within its natural and cultural surroundings. Since the 2007 report, considerable alterations to the land cover on JBLE-Eustis have occurred. New construction/development has altered the forest within various compartments, directly impacting previous management recommendations. Additionally, some previous silvicultural recommendations not implemented within specified timelines in the 2007 Forest Inventory needed to be revised or are now obsolete. The purpose of forest inventories and assessments are to comprehensive re-inventories of the installation's forest resources and to impart sound management recommendations to promote a more sustainable, healthy forest/vegetative component that is compatible for land uses in both training lands and urban forests.

The primary objective of the JBLE-Eustis forest management program is to maintain and enhance the installation's ecological integrity in support of the military mission (AFI 32-7064). USAF policy stipulates that forest resources must be managed for long-term sustainability and compatible with federally listed threatened and endangered species, maintaining biodiversity, protection of the Chesapeake Bay watershed, wildlife habitat enhancement and outdoor recreational activities. The forest management program must also fully comply with all applicable federal laws, policies, and regulations pertaining to forest management, including:

- Military Construction Authorization Act, Sale of Certain Interests in Lands-Logs (10 USC § 2665).
- DODI 7310.5, Accounting for Production and Sale of Lumber and Timber Products.
- Executive Order 11990, Protection of Wetlands.
- Endangered Species Act of 1973, as amended (16 USC §§ 1531 et seq.).
- National Forest Management Act of 1976 (16 USC §§ 1601 et seq.).

As a result of past management activities, the forests have gone from mostly hardwoods with interspersed pines during pre-settlement times to an ecosystem dominated by loblolly pines. In some cases, invasive species such as tree of heaven and Chinese privet have grown extensive stands thereby disrupting the native ecosystems. Additionally, in some cases sweet gum, though native has created thick stands that preclude a healthier hardwood forest. This INRMP emphasizes the reestablishment of native and ecologically diverse forest ecosystems as part of commercial pine timber production. Hardwood-dominated areas will be managed under the selection silviculture system to maintain hardwood dominance. Small group selection harvest in hardwood-dominated stands will be conducted to maintain an oak component, important for wildlife. A rotation age of 75 to 80 years for loblolly pine stands and 100 years for mixed pine-hardwood stands will be used; however, these harvest schedules will be adjusted to maintain stand vigor, to salvage timber, to prevent insect and disease damage, or to meet site conditions.

Timber is commercially harvested in wetlands or in riparian and wetland buffer zones in accordance with federal/state best management practices (BMPs); however, the representations of

existing ecological communities will be retained. Logging operations will be scheduled to avoid periods of excessively wet soil conditions in order to protect soils and to prevent erosion and possible sedimentation of streams. Diversion ditches will be constructed on skid trails and forwarder roads to prevent erosion. BMPs developed by the [Virginia Department of Forestry](#) (VDOP) will be implemented in all forest management activities (VDOP 2002a).

JBLE-Eustis employs a variety of forest management practices to manage complex ecosystems and achieve the desired vegetation conditions. Timber harvests; timber stand improvement (TSI); regeneration; salvage; prescribed fire; and wildfire, insect, and disease suppression/protection improve forest sustainability and are consistent with maintaining the military mission. No single set of prescriptions can be applied that will capture the dynamic nature of forest ecosystems.

TSI is employed when conditions of developing stands do not meet forest management objectives. It is used primarily to improve the timber quality of selected trees by removing other trees or vegetation that competes for light, nutrients, and moisture. This may include control measures for invasive plant species and is performed in accordance with the JBLE-Eustis Integrated Pest Management Plan. Under ecosystem management, TSI concentrates not just on promoting timber value, but also on enhancing wildlife values and species diversity. Oaks are favored for their wildlife and timber value, pines for commercial production, and shade-tolerant species to promote species diversity. Trees in the cantonment area will be harvested on an as-needed basis for TSI, safety concerns or new construction. TSI efforts will be concentrated on recently logged areas and the more productive sites where developing small-diameter stands are becoming overcrowded. Prescribed burning when available combined with TSI to enhance wildlife habitat and increase biodiversity. Herbicides are used as part of TSI for precommercial thinning and reforestation. TSI (and other forestry work) occurring in training areas will usually be performed in support of training missions; however, in general all such work is coordinated between the ASA and CES. Typically, representatives from ITAM and CEIE meet on the first Wednesday of each month to plan and coordinate related work.

TSI used on JBLE-Eustis include:

- **Pre-Commercial Thinning.** Pre-Commercial thinning is a management tool used in overstocked forestland (mostly pine stands) 5-10 years of age. This practice is used to select the dominant trees in the stand and removing undesirable trees to maintain a 10-foot spacing or 435-450 trees per acre.
- **Commercial Thinning.** Commercial thinning is a management tool used in overstocked stands between the ages of 18-28 years. The objective of this type of thinning is to provide additional growing space for the more desirable healthier trees in the forest stand. Optimum thinning results is a 20-25' spacing or 80-110 trees per acre.
- **Selective Harvest.** Selective harvest is a management tool used for the selective removal of mature pine and less desirable hardwoods and to enhance specie composition. Use of this selective harvest method provides for the overall health of the forest and the improvement of wildlife habitat.
- **Clear Cut Harvest.** This management tool is normally used to establish monoculture forest types (Pine Plantations) but this tool at JBLE-Eustis would only be used to remove all the trees in a given construction site area.

- Emergency Timber Salvage. This is a non-planned sale of commercial timber, normally with storm damage, insect damage, and unplanned construction.

It is necessary to maintain forest protection measures in order to prevent unacceptable degradation of the resource resulting from drought and other weather/climate phenomena, disease, insect and animal damage, invasive species, and wildfire. CEIE with assistance from the installation pest control contractor monitors for gypsy moth, Asian long-horned beetle, southern pine beetle, and other forest pests. A baseline forest entomological survey was initially designed in 2010 and completed in 2015. CEIE coordinates with the VDOF and U.S. Forest Service (USFS) to determine fire danger ratings on a monthly basis to inform military trainers of potential fire danger for modifications of training activity. Salvage cutting will be employed whenever necessary to remove dead trees or trees damaged by injurious agents other than competition in order to recover economic value and prevent the spread of insects and disease.

Timber sales and other forest management practices are coordinated through CEIE. Timber sales and other forest management practices associated with training areas are coordinated also with the range and training management agency to minimize disruption to military training schedules and to integrate forest management with military training.

CEIE performs timber cruises of compartments (or portions thereof) selected for timber sales to determine the fair market value. The US Army Corps of Engineers-Norfolk District normally supports these efforts for MILCON projects at a minimum. A Report of Availability (ROA) for timber is then prepared for each timber sale and submitted through AFCEC for timber sales at JBLE-Eustis.

Trees and forest products with marketable value shall not be destroyed, removed, given away or abandoned. The Federal Government will be compensated for all such commercial forest products. CEIE is the only authorized entity at JBLE-Eustis to perform timber/forest product sales.

Mulch and Firewood Program. These programs were suspended due to red imported fire ant populations and USDA/VDACS regulated items.

Table 7-1. Historical and current logging & forest management areas based on Figure 7-6

Site #	Year cut	Cut types	Comments	Hardwood board feet	Pine board feet	Acres
0	No data	Clear cut	cut year not specified on source map	21860	17680	8.727809
1	1988	Clear cut	cut for dredge spoil dumping, no tree data			41.466238
2	1974	Clear cut		3000	102000	9.869883
3	1975	Not specified	cut type not specified on source map (additionally, hazard tree & limited log removal in 2008 and thinning of 10 acres of pine in 2013)			31.098819
4	1971	Not	cut type and tree info not			4.254385

Table 7-1. Historical and current logging & forest management areas based on Figure 7-6

Site #	Year cut	Cut types	Comments	Hardwood board feet	Pine board feet	Acres
		specified	specified			
5	1993	Clear cut	tree information not specified			8.219522
6	1975	Not specified	same area clearcut in 1993	20000	45000	33.688039
7	1967	Clear cut				14.23946
8	1969	Seed tree cut	125 cords of pine	0	106975	19.147923
9	1993	Clear cut	tree info not specified			10.39551
10	1991	Clear cut	tree info not specified			5.280715
11	1993	Clear cut	tree info not specified			7.127187
12	1993	Clear cut	tree info not specified			19.445694
13	1981	Pine removal	No other info specified			33.260981
14	1968	Seed tree cut		11000	422000	26.846305
15	1968	Seed tree cut	120 cords	22000	340000	37.699028
16	1971	Not specified	total pilings, listed to include 3 other sales at least			15.243746
17	1973	Clearcut		0	260341	11.896637
18	1976	Not specified		24048	446985	18.492669
19	1993	Clear cut	No tree info specified			16.50116
20	1995	Pine removal			550000	50.474849
21	1981	Not specified		16000	206000	16.773365
22	1966	Thinning	Area clearcut in 1991	24000	202000	40.478543
23	1970	Clear cut		0	86000	6.861304
24	1969	Seed tree cut	41 Acres	0	337343	42.409967
25	1979	Not specified		0	528076	45.957933
26	1991	Clear cut	Tree info not specified			34.111686
27	1986	Clear cut	Tree info not specified			36.839197
28	1972	Not specified	Same area clearcut in 1988			28.134959
29	1983	Not specified	tree info not specified			2.438755
30	1971	Not specified	tree info not specified			4.461801
31	1966	Clear cut		0	73600	10.20683
32	1989	Clear cut	tree info not specified			12.679861

Table 7-1. Historical and current logging & forest management areas based on Figure 7-6

Site #	Year cut	Cut types	Comments	Hardwood board feet	Pine board feet	Acres
33	No data	Pole & piling harvest	Year not specified, heavy metal contaminated			26.990409
34	1984	Clear cut	112 Acres	40000	1650000	91.926272
35	1969	Clear cut	22 Acres	0	416025	17.46255
36	1983	Not Specified	Not tree info specified			23.53641
37	1989	Clear cut	Cut includes interior polygon cut in 1971			28.863421
38	1971	Not Specified	Tree info not specified			3.746319
39	1989	Clear cut	No tree info specified			2.773697
40	1989	Clear cut	no tree info specified			21.7803
41	1968	Seed tree cut	Area clearcut in 1971	91000	1617000	104.976227
42	1972	Not specified	Hardwoods listed as all B. Walnut	10154		4.143646
43	1983	Not specified	add on for 1983 timber cuts			18.804026
44	1983	Not specified	Boardfeet listed here are totals for all of 1983			37.22418
45	1967	Seed tree cut	150 cords, 80 Acres			71.551992
46	1975	Not specified	1 acre	3000	2000	1.368731
47	2014	Clear cut	TA 17C: 20 acres, replanted 1,500 mixed oak saplings, 1104 tons of pine saw timber	0	174000	19.827601
48	2008	Clear cut	20.5 acres, TEMF Project (formerly TA3)	130000	7500	20.734978
49	2009	Clear cut	2 acres, Grow The Army facility construction along Lee Blvd	4000	3000	1.534801
50	2010	Clear cut	2900 Block General Quarters, 26,000 BF Tulip Popular	9000	40000	4.458493
51	2003	Clear cut	CID building vic Wilson Ave & Washington Blvd	7000	5000	1.511605
52	2011	N/A	Reforestation of Wastewater Treatment Plant, 600 mixed oaks			3.082565
53	2013	TSI	Planted 100 mixed oaks			9.641684
54	2012	TSI				3.091775
55	2012	N/A	Planted 100 mixed oaks in NWSG and Wildflower area			1.416497

Table 7-1. Historical and current logging & forest management areas based on Figure 7-6

Site #	Year cut	Cut types	Comments	Hardwood board feet	Pine board feet	Acres
56	2010	Clear cut	Ditch Line	0	33000	3.124999
57	2006	Clear cut	UOS	0	7000	2.16407
58		N/A	Reforest abandoned area, planted red oaks			0.386861
59	2011	TSI	50% standing pine removal			1.742664
60	2011	TSI	50% standing pine removal			0.752968
61		TSI	30% standing pine removal, planted 20 red oaks			0.818054
62		TSI	Planted 20 mixed oaks			1.155668
63	2012	N/A	Planted 200 mixed oaks			4.864552
64	2018	Clear cut	Aviation Complex Facility			16.00000
65	2018	Clear cut	Aviation Complex Facility			8.00000
	2016	TSI	Eustis Lake-Taylor Ave-removal of 6 hazard trees and pine overgrowth			2.00000
66	2022	FAAF	Tree removal in Flight Clear Zone			132.0

7.8 Wildland Fire Management

Applicability Statement

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section is applicable to this installation.

Program Overview/Current Management Practices

In accordance with USAF policy, a Wildland Fire Management Plan (WFMP) was originally prepared and included in the 2014 INRMP version. However, beginning in January 2018, AFCEC was in the process preparing a new WFMP for JBLE-Eustis. Completion is expected later in CY 2018 and will be incorporated as an appendix. All military, civilian, contractor and emergency services personnel involved in wildland fire management must possess certifications appropriate for their expected level of involvement in the wildland fire program.

Wildfires

The current threat from wildland fire to JBLE-Eustis is low. The climate is not currently conducive to extensive fire activity, and the mission includes only relatively small-scale fire-prone activities. Any predicted changes to wildland fire frequency or intensity should be considered within this context.

All climate scenarios suggest an increase in temperature and all but the RCP4.5 2030 scenario indicate an increase in annual precipitation. However, in all scenarios there are periods during the year when precipitation is expected to decrease. Many of these overlap with the existing spring and fall fire seasons at JBLE-Eustis, indicating potential for hotter and drier fire seasons. Combined with the increased temperature in all months of all climate scenarios, this is likely to lead to increased probability of ignition during months in the spring and fall when precipitation is projected to decrease.

However, the timing and magnitude of these drier periods varies markedly from between climate scenarios. This makes it difficult to make any general conclusions other than there is some potential for increased fire ignition potential and fire intensity during limited portions of the year. During the remainder of the year, the increase in temperature is accompanied by an increase in precipitation. In these months, there is likely to be a decrease in fire activity.

Climatic changes are expected to have little impact on the broad vegetation classification of JBLE-Eustis. The hardwoods and loblolly pine stands (with little understory vegetation) do not support extreme fire behavior and these species are expected to continue to dominate. However, the dominant wetland type of JBLE-Eustis can support rates of spread and flame lengths that are problematic for control under dry conditions, which are likely to become more common. Additionally, if *Phragmites australis* continues to invade wetland areas, the high flammability and increased fuel load (Gucker, 2008) will increase the likelihood of successful ignitions and the potential for higher intensity fire wherever it exists in large populations. This projection will only be valid if ignition sources co-occur with locations invaded by *P. australis*. The limited fire history available for JBLE-Eustis identifies tracer rounds at small arms ranges, cigarettes, and training pyrotechnics as primary wildland fire causes (USAF, 2014). Although there is little current overlap between *P. australis* and the small arms ranges where there is a high volume of ignition sources, *P. australis* does cover significant areas within the training areas and the remainder of the installation, leading to a potential for increased ignition probability.

Based on the above considerations, there may be a slight increase in the number of wildfire ignitions and the intensity of those fires due to co-occurrence of increased temperature and decreased precipitation in some months. The timing of this increase varies among climate scenarios. This change will be most notable in emergent and shrub-scrub wetlands invaded by *P. australis*, but only where wetlands are not overtaken by sea level rise. Fire behavior in forested areas is expected to remain low to moderate.

Prescription Fires

Prescription fires have not been used extensively on JBLE-Eustis as a forest management tool due to a lack of available staffing, lack of ability to schedule prescribed burns in needed areas and frequent high ground moisture that limits the effectiveness of prescribed burning. Nonetheless, it remains as a potential tool when sufficient resources are available and targeted areas can be scheduled. When prescription fires are used, the JBLE-Eustis forester/prescribed burn manager (within CEIE) prepares a prescription fire plan that follows the guidelines of the State Prescribed Burn Program (VDOP 2002b) and is fully coordinated with Fire & Emergency Services, Training Division (ASA) and 1st Fighter Wing (when planned in training areas or affecting flight

operations), PAO and Installation Safety Office. This plan includes a map that indicates each burn unit and the location of all fire lines, firebreaks, roads, adjacent properties, and other important landscape features. In addition, the burn plan identifies smoke-sensitive areas and wind direction and speed, and smoke dispersal is considered before conducting a burn. Smoke management guidelines are presented in the [Prescribed Fire Smoke Management Guide](#) (VDOF 1998). Weather guidelines set by the VDOF Fire Protection Team (VDOF 1998) are followed to ensure a safe, effective burn. Fire weather forecasts are available from the Felker airfield control tower and at the National Weather Service website: www.bio.noaa.gov/firewx.htm. CEIE requests prescription fire support from the Air Force Wildland Fire Center. The Air Force Wildland Fire Center (a component of AFCEC) is headquartered at Eglin AFB, Florida, and was established in 2012 to manage wildland fire issues at USAF installations. Prescription fire support is provided when available.



Prescription Fire to Manage Timber.

7.9 Agricultural Out leasing

Applicability Statement

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section is not applicable to this installation.

Program Overview/Current Management Practices

Currently, there is no agricultural out leasing at JBLE-Eustis.

7.10 Integrated Pest Management Program

Applicability Statement

This section applies to USAF installations that perform integrated pest management activities in support of natural resources management (e.g., invasive species, forest pests, etc.). This section is applicable to this installation.

Program Overview/Current Management Practices

General. Integrated pest management (IPM) is a key component to natural resources management and consequently, these two programs shall be integrated. Pest species include those impacting operations both in cantonment and natural areas but also those that may affect wildlife or habitats. These include hematophagous arthropods (such as mosquitoes, ticks, deer flies, horse flies, biting midges, and others), other arthropods with parasitic stages (such as chiggers, bot flies, etc.) as well as invasive or undesirable plants, and forest insect pests affecting the health and quality of forest resources. Some biting arthropods vector serious disease organisms pathogenic to humans and wildlife. Additionally, some vertebrate species may be nuisances or hazards. In some cases, these organisms also affect the biodiversity. Pest management activities are overseen by the Installation Pest Management Coordinator (IPMC). The IPMC is assigned to the Natural Resources & Integrated Pest Management Team within CEIE. The IPMC coordinates with Team staff to ensure the success of pest control actions. The JBLE-Eustis Integrated Pest Management Plan (IPMP) addresses the relationship of pest management activities to other natural resources management activities and is cross-referenced with the INRMP. The relevant pest management policy regulations are provided in DODI 4150.07 (Pest Management Program) and AFMAN 32-1053 (Integrated Pest Management). Additionally, the IPMC serves as the invertebrate fauna biologist/subject matter expert to identify when pest conditions exist as well as incorporate invertebrate fauna into overall natural resources management.

Management and conservation of arthropod fauna

General. The INRMP and IPMP shall be cross-referenced to ensure all pest control techniques are evaluated to determine whether such actions pose significant risks to non-pest species.

Western honeybees (*Apis mellifera*). Feral colonies of domestic western honeybees occur on the installation. These colonies may conflict with operations at times and corrective action shall be ascertained by the Installation Pest Management Coordinator (IPMC) in consultation with the Natural Resources Manager.

1. Western honeybees are considered fauna on the installation and shall not be removed, disturbed, or killed unless approved by the IPMC.
2. The following prioritized course of action shall be implemented in cases where honeybees and military operations conflict:
 - a. Leave the colony in its current location if it does not pose a significant health & safety risk. Options include (but are not necessarily limited to) installing a barrier or warning signage/markers, or waiting a short period (i.e., 24 hours or several days) to see if the colony disperses.
 - b. If it appears to pose a health and safety risk, the IPMC shall attempt to contact a local beekeeper to acquire the bees.
 - c. If no beekeeper can be contacted or is not available/interested, the colony may be euthanized in accordance with the JBLE-Eustis Integrated Pest Management Plan/appropriate techniques under the direction of the IPMC.

Rusty patched bumble bee (*Bombus affinis*). This federally endangered species is not documented at JBLE-Eustis; however, surveys should be implemented to determine presence/absence pending availability of resources. Additionally, removal of those pollinator species that pose health and safety conflicts with personnel shall be evaluated on a case-by-case situation.

Conservation of insects and other arthropods. Insects and other arthropods have critical ecological roles that directly or indirectly influence habitats including food sources for wildlife, predation, parasitoidism, parasitism, disease vectoring, soil constituents, pollination, decomposition, seed dispersal, and herbivory. Such functions are significant in terrestrial and aquatic environments. Consequently, pest management activities in natural resources require careful examination and planning. Examples include (but are not limited to) surveillance (possible control) of Southern pine beetle (*Dendroctonus frontalis*) and other bark beetles in forested areas, surveillance (and possible control) of spongy moth in forested areas, control of other native & invasive forest insects, control of insects in areas of the airfield when/if they are deemed to increase BASH risks, beech blight aphid (*Grylloprociphilus imbricator*), and control of invasive vegetation. Annual inventories of insects and other arthropods shall be performed in order to maintain knowledge of species present on the installation.

Veterinary entomology. Several hematophagous arthropods that adversely affect native wildlife have been documented on JBLE-Eustis. These arthropods primarily consist of ixodid ticks, mosquitoes, tabanid flies, ceratopogonid biting midges (*Culicoides* spp.) and *Trichodectes canis*. Additionally, the deer bot fly (*Cephenemyia phobifer*) has been documented in deer from JBLE-Eustis. Parasitic mites of the genus *Sarcoptes* that causes mange in mammals may be present in the natural environment but has not yet been identified.

Surveillance in 2024-2029:

Continuation of the Tick & Tick-Borne Disease Threat Assessment. Tick drags and wildlife examinations continue annually with support from US Army Public Health Command or USAF laboratory equivalent in disease pathogen analysis.

Surveillance for Red Imported Fire Ant (RIFA). Establishment of RIFA on the installation poses serious impacts on wildlife such as ground-nesting birds, small mammals and herpetofauna as well as health and safety risks to personnel. Surveillance is performed by 733 CES natural resources and pest control staff.

Monitoring of biting flies (mosquitoes, tabanid flies, and ceratopogonid biting midges). Monitoring consists of annual mosquito species inventories and disease vector surveillance performed by McDonald Army Health Center Preventive Medicine (MAHC) and 733 CES. Additionally, 733 CES monitors for tabanid flies at several locations throughout the installation to monitor numbers and duration of seasonal activity.

Curculionidae: Scolytinae (bark and ambrosia) beetles. Surveillance for bark beetles, particularly *Dendroctonus* and *Ips* shall be designed and implemented based on available resources. This includes Southern pine beetle (*Dendroctonus frontalis*), black turpentine beetle (*Dendroctonus terebrans*), eastern six-spined engraver (*Ips calligraphus*), eastern five-spined engraver (*Ips*

grandicollis), and the southern pine engraver (*Ips avulsus*). As of 2015, only *Dendroctonus terebrans* and *Ips grandicollis* have been documented. Surveillance shall include installation over flights when it can be supported and trapping. Monitoring of natural enemies of bark beetles particularly *Thanosimus dubius* shall be included to determine predator-prey population relationships.

Invasive Species

Invasive Species Management. An invasive species is defined as a species that is (1) nonnative (or alien) to the ecosystem under consideration and (2) whose introduction harms or is likely to harm economic, environmental, or human health (EO 13112, Invasive Species, February 1999). EO 13112 established the National Invasive Species Council, co-chaired by the Secretaries of Agriculture, Commerce, and Interior. The [National Invasive Species Management Plan](#) recognizes that human actions are the primary means of invasive species introductions. It is a blueprint for federal action to prevent the introduction of invasive species, provide for their control, and minimize their economic, environmental, and human health impacts (National Invasive Species Council 2001). EO 13112 directs federal 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” and identifies actions that may affect the status of invasive species. Subject to availability of appropriations and to the extent practicable and permitted by law, each federal agency shall use relevant programs and authorities to:

- Prevent the introduction of invasive species.
- Detect and control such species in a cost-effective manner.
- Monitor invasive species populations.
- Provide for restoration of native habitats that have been invaded.
- Conduct research on invasive species to prevent introduction and for scientifically sound control.
- Promote public education on invasive species.

Primary management objectives recommended in EO 13112 are to eradicate small infestations and contain expansive infestations. Early eradication of small infestations will save significant time and money and will be more successful than attempts to eradicate larger infestations.

Several federal and Commonwealth of Virginia agency websites offer insight as to invasive organisms that may occur or could occur in the future at JBLE-Eustis. This include:

Virginia Department of Conservation and Recreation:

<https://www.invasivespeciesva.org/>
<https://www.dcr.virginia.gov/natural-heritage/ip>

Virginia Department of Agriculture & Consumer Services:

<https://www.vdacs.virginia.gov/plant-industry-services-spotted-lanternfly.shtml>
<https://www.vdacs.virginia.gov/press-releases-220708-spotted-lanternfly-expanded-quarantine.shtml>

U.S. Department of Agriculture National Invasive Species Information Center
<https://www.invasivespeciesinfo.gov/species-profiles-list>

Invasive plant species on JBLE-Eustis include common reed (*Phragmites australis*), tree of heaven (*Ailanthus altissima*), Chinese lespedeza (*Lespedeza cuneata*), Chinese privet (*Ligustrum sinense*), golden bamboo (*Phyllostachys aurea*), Wisteria (*Wisteria floribunda/sinensis*), English ivy (*Hedera helix*), johnson grass (*Sorghum halepense*), Japanese stiltgrass (*Microstegium vimineum*), kudzu (*Pueraria* spp.) and others. Some are more important than others based on their ability to spread, complexity of control and impact on the military mission. Dense stands of common reed exist extensively in wetlands and to some extent in damp upland areas. Many of these areas include training areas where line of sight is greatly impaired creating safety issues, force protections challenges, wildland fire potential and overall degradation of the local ecology. Tree of heaven, bamboo, wisteria, kudzu, Chinese privet and Japanese honeysuckle have a major impact on training areas by creating dense, impassable stands that preclude effective training. Wisteria, kudzu and English ivy can also kill trees.

Based on previous surveys, an Invasive Species Management Plan was originally prepared in 2008 with a primary focus on vegetation. This plan was revised in 2011, 2013, and 2017 and updated in 2023 to articulate the status of invasive plant species and include known and potential invasive vertebrate and invertebrate organisms. This revised plan is included in Section 15.

Management of invasive species is performed in accordance with the INRMP and the Invasive Species Management Plan. In most cases, eradication of any given species is unrealistic. Management is the operative word and is dependent on flexibility, availability of resources, and implementation of integrated control measures. It must be perpetual and requires resources annually to achieve acceptable levels. Control measures do not necessarily comprise a one-time action. Surveillance for invasive species not yet established is instrumental in managing for these organisms.

Invasive vertebrate species with established populations include the coyote (*Canis latrans*), European starling (*Sturnus vulgaris*), English house sparrow (*Passer domesticus*), rock dove (*Columba livia*). Coyotes increases risks of tick-borne diseases, potential rabies exposures, and adversely impacts native wildlife. European starling competes with native bird species, nests in structures to include living quarters where it presents health issues from fecal deposition and fowl mites (*Ornithonyssus sylviarum*) as well as a BASH issue at Felker Army Airfield. English house sparrows frequent occupied structures and may enter food handling facilities thus contributing to human health issues. Rock doves may roost in structures creating health issues from fecal deposition.

Other invasive vertebrate species occur locally and though are not yet established on the installation. Currently, these include nutria (*Myocastor coypus*) and mute swans (*Cygnus olor*). Nutria are large aquatic rodents native to South America. This species damages native marsh habitats which could be problematic for the installation in terms of flooding, erosion, and ecological functions. Populations exist in the local area. Surveillance is critical to preventing their establishment on the installation. Mute swans have been observed locally but no nesting activity

has been noted on the installation to date. This species competes with native migratory waterfowl, damages native vegetation, and could be a BASH risk.

Several invasive invertebrate species are known to occur on the installation including red imported fire ants (*Solenopsis invicta*), Japanese beetle (*Popillia japonica*), and Asian tiger mosquito (*Aedes albopictus*).

Japanese beetles are well established on the installation and cause damage to numerous plant species including newly planted vegetation used in habitat improvements. A key example was the observation of Japanese beetles attacking native marsh mallow (*Althaea officinalis*) in wetlands where common reed (*Phragmites australis*) was being controlled. Asian tiger mosquitoes are significant biting nuisances and potential disease vectors and can impact some native mammals. The first red imported fire ant colony was found and neutralized on JBLE-Eustis in 2013. Since then, a colony was found in December 2020 and several additional colonies documented in 2022 and 2023 with two new colonies identified in early CY 2024. This species poses a serious threat to wildlife, other native invertebrate fauna, and as stinging nuisances to personnel.

Several other invasive invertebrates that have been documented on the installation include the kudzu bug (*Megacopta cribraria*), brown marmorated stink bug (*Halyomorpha halys*), Asian lady beetle (*Harmonia xyridis*), European hornet (*Vespa crabro*), Chinese mantis (*Tenodera sinensis*), and the shovel-headed garden worm or hammerhead worm (*Bipalium kewense*).

The kudzu bug is an agricultural pest and does not pose issues for the installation in that respect. However, it does enter structures at times and can release a foul-smelling odor and the causative substance can also irritate exposed skin. The brown marmorated stink bug is common on the installation and is also an agricultural pest. It has the potential to enter structures in large numbers and also release a foul odor. Asian lady beetle competes with native lady beetle species and sometimes enters structures in large numbers in the fall.

The European hornet (*Vespa crabro*) and the Chinese mantis (*Tenodera sinensis*) are documented on the installation. The European hornet is predatory on other insects and is known to girdle twigs by which to obtain sap while the Chinese mantis is a general predator that competes with native mantids and is known to feed on small vertebrate prey (including anurans, lizards and hummingbirds). Natural resources staff observed competition behaviors between European hornets and other insects for food sources. A resident of the privatized housing provided a photograph of a hammerhead worm that was observed in a garden. This large flatworm is a predator of earthworms. The extent of this species on the installation is unknown.

Several other nonnative insects documented on the installation that pose as potential forest pests include ribbed pine borer (*Rhagium inquisitor*), *Ambrosiodmus rubricollis* (no common name), *Euwallacea validus* (no common name), fruit-tree pinhole borer (*Xyleborinus saxesenii*), alnus ambrosia beetle (*Xylosandrus germanus*), and Asian Ambrosia Beetle (*Xylosandrus crassiusculus*). Information on the extent of these species on the installation is limited.

Several other invasive invertebrate species have potential for establishment on the installation in the near future. These include (but not necessarily limited to) red swamp crayfish (*Procambarus*

clarkii), rusty crayfish (*Orconectes rusticus*), Asian long-horned beetle (*Anoplophora glabripennis*), spongy moth (*Lymantria dispar*), Sirex woodwasp (*Sirex noctilio*), spotted lanternfly (*Lycorma delicatula*), redbay ambrosia beetle (*Xyleborus glabratus*), and beech scale (*Cryptococcus fagisuga*).

Zoonotic Diseases

Zoonotic diseases are infectious diseases that can be transmitted to humans from animals. This primarily refers to several wildlife species but can include feral domestic animals. Rabies and tick-borne diseases comprise some of the more potentially serious diseases known to occur on the installation. Since 2006, four confirmed cases of rabies in wildlife have been documented including red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*) and Virginia opossum (*Didelphis virginiana*). A Tick and Tick-borne Disease Threat Assessment was initiated in 2007 and continued annually with data collected through 2019. This effort revealed eight ixodid tick species and eleven tick-borne disease pathogens existing in wildlife hosts/reservoirs and ticks including *Borrelia burgdorferi* (agent of Lyme disease), *Borrelia lonestari* (agent for Southern Tick Associated Rash Illness), *Babesia macroti* (agent for human babesiosis), *Babesia canis* (agent for canine babesiosis), *Rickettsia parkerii* (agent for Tidewater Spotted Fever), *Ehrlichia chaffeensis* (agent for Human Monocytic Ehrlichiosis), *Ehrlichia ewingii* (agent for Canine Granulocytic Ehrlichiosis), *Rickettsia amblyommii* (Rickettsiosis), *Rickettsia parkerii* (Tidewater spotted fever), *Borrelia miyamotoi* (*Borrelia miyamotoi* disease), and *Anaplasma phagocytophilum* (agent for Human Granulocytic Anaplasmosis). In 2011, 64 raccoons were screened for the infectious roundworm *Baylisascaris procyonis*. Two raccoons were found to be infected with the roundworm (which is an internal parasitic macroinvertebrate that is highly pathogenic to humans). The egg stage of parasite can remain viable in soil for many years. Once ingested by humans or wildlife other than raccoons, the eggs hatch. The number of eggs ingested correlates to the extent of harm to the host.

Nuisance Wildlife

Wildlife that interfere with the military mission, or other wildlife that pose safety/health risks to humans are considered nuisance wildlife. Nuisance wildlife include any number of species as this varies considerably based on several factors. Common nuisance wildlife at JBLE-Eustis are resident Canada geese, raccoons, groundhogs, coyotes, European starlings, and other species depending on the situation. Additionally, feral domestic animals (primarily cats) pose ecological and human health issues though such as not considered wildlife.

Resident Canada geese. Both resident and migratory Canada geese are protected under provisions of the Migratory Bird Treaty Act (MBTA). Depredation of nuisance Canada geese is managed by the natural resources staff of CEIE under permits issued by USFWS. CEIE maintains appropriate permits to deal with nuisance geese should depredation be necessary.

Beavers. Beavers can become nuisance species when their dam-constructing activities block culverts and cause flooding of roads or training areas. Beaver damming can be environmentally beneficial and create or improve wildlife habitat; therefore, control actions are taken only when necessary. Several cases have resulted in the need to remove beavers on the installation.

Domestic animals. Feral/stray domestic animals are not considered wildlife. The Commonwealth of Virginia identifies them as companion animals. Domestic cats and dogs that are released onto installation or enter the installation from Newport News can become serious pests on military installations. Feral domestic animals may serve as hosts for ticks and subsequent tick-borne diseases, as well as other diseases such as rabies, distemper, and feline leukemia (cats) posing a serious health threat to humans, other family pets and military working dogs. Furthermore, cats and dogs can be destructive of certain wildlife populations by predation. Feral/stray cats occurring on the installation primarily originated in Newport News and entered the installation. It is conceivable that some may have been intentionally liberated or abandoned by privatized housing residents though this is not expected to be a primary source. As of the date of the INRMP, the Peninsula Regional Animal Shelter will not accept feral/stray cats without compensation from the installation. No line of accounting exists and consequently, no viable removal opportunities exist. However, installation community members are advised to not feed stray/feral cats nor provide harborage.

Coyotes. Coyotes were first observed on the installation in 2008. Trapping efforts removed five individuals (1 adult male, 1 adult female and 3 juveniles) from the golf course in 2010. Visual encounters and signs were not observed until 2016 when several installation community members reported seeing coyotes. This included a possible sighting in the BBC housing area and one individual was observed behind the elementary school on a wildlife camera. Trapping was initiated by USDA in 2016 and supplemented by natural resources staff; however, no coyotes were caught. A group of five individuals (possibly a family group) were observed at the golf course by law enforcement personnel in 2017. Trapping efforts were initiated in June 2017 with one juvenile captured and a second juvenile captured in March 2018. Wildlife cameras installed at selected locations throughout the installation documented additional sightings suggesting this species occurs throughout the installation.

Surveillance. Natural resources staff continue with surveillance based on reports from the installation community members, visual encounters by the staff, and wildlife cameras deployed all year. Information from these sources is used to determine coyote travel corridors.

Impact on mission. Coyote management is considered the 2d wildlife management priority behind whitetail deer management. Coyotes can inflict significant losses on several wildlife species and pose potential health & safety risks to personnel. Natural resources staff recovered 7 whitetail deer fawn carcasses killed by coyotes as evidenced by crushed skulls, canine teeth punctures and bone markings from July-September 2017. Recreational deer harvest of the fawn and doe segments in 2017 were significantly reduced. The reduction of fawn harvests is due to the coyote depredation, and the reduction of doe harvest is at least partially due to coyote depredation. Coyotes are particularly detrimental to ground-nesting avian species such as wild turkey and bobwhite quail with the conditions potentially leading to population collapse and species extirpation. Other mammalian and herpetofauna wildlife can also be adversely affected. Coyotes can pose an additional source of rabies exposure to mammalian wildlife and humans. All 7 coyotes that have been removed contained heavy ixodid tick loads and several were infected with tick-vectored pathogens known to cause disease in humans. Additionally, one individual capture in 2018 appeared infested with the louse *Trichodectes canis*. Potential transfer of this louse to humans or military working dogs is feasible but risk assessments requires further research. No

cases of mange (as caused by the *Sarcoptes scabiei* mite) have been identified in coyotes (or other mammals) on the installation to date. Various reports of coyote sightings in Newport News and York County suggests potential for additional individuals to enter the installation.

Control efforts. Removal of coyotes from JBLE-Eustis is critical based on the impacts described above. Control techniques are typically resource-intensive in terms of manpower and time. Access to affected training areas and ranges limits the time of day and time frames due to military unit training area occupancy and range fire schedules. Natural resources staff with assistance from USDA-WS to conduct trapping and sharpshooting efforts; however, this has not been effective.

Other mammalian species potentially posing issues. Several other vertebrate species such as snakes, raccoons, bats, squirrels, groundhogs, mice, rats, and opossums are considered pests when inside and around the immediate area of buildings (or other structures/facilities) and require periodic removal in accordance with applicable regulations. Building occupants/users shall contact CEIE if nuisance wildlife exists in these areas. All other problematic wildlife incidents (whether real or perceived) shall be coordinated with CEIE staff to avoid potential violations of state and/or federal laws as well as appropriate disposition of the animal regarding disease issues or wildlife management. It is a violation of certain federal and state laws as well as installation policy to feed wildlife with the exception of bird feeders. Bird feeders are discouraged however, as these create conditions that encourage rodents (and subsequently snakes) to the area. An occupied supply warehouse (Building 1610) had been impacted by the presence of evening bats (*Nycticeius humeralis*) for several years before effective removal was completed. Several individual bats contained parasitic bat bugs (*Cimex adjunctus*) and mites which increased risks to building occupants. Groundhogs (*Marmota monax*) can present a threat to the integrity of earth-covered magazines, range fire targeting systems, landfill caps, building footings, and underground wiring/piping. When groundhog activity becomes detrimental, individuals are live captured and released elsewhere on the installation or euthanized. Whitetail deer can become nuisances by over browsing vegetation or pose health and safety risks in terms of vehicular accidents, BASH or contributing to maintenance of tick-borne disease pathogens in the environment.

Ospreys, bald eagles, and other nesting birds. Nesting activities of certain avian species poses conflicts with mission requirements at times. Ospreys (*Pandion haliaetus*) and crows (*Corvus* spp.) sometimes build nests on military watercraft or cranes at 3d Port. Bald eagles sometimes build nests in military aircraft flight paths creating potential BASH issues. Passerine birds construct nests in military vehicles that remain parked in motorpools for extended periods or in structures. Large numbers of mixed species flocks including common grackles (*Quiscalus quiscula*), European starlings, and brown-headed cowbirds (*Molothrus ater*) pose BASH issues. Brown-headed cowbirds also impact populations of warblers and other songbird species.

7.11 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section is applicable to this installation.

Program Overview/Current Management Practices

BASH is an important component of safe operations at Felker Army Airfield. Since BRAC 2005 and joint basing, the US Department of Agriculture-Wildlife Services (USDA-WS) as an agent for 1ST Fighter Wing (1FW) prepared a consolidated BASH Plan for JBLE. Bird species, including various gulls, Canada geese, and blackbirds, create potential hazards because of their attraction to the short turf grass in the airfield clear zone for loafing and feeding. Other birds that present a potential hazard are killdeer, which are attracted to old taxiways and bare ground, and turkey vultures and raptors, which circle over food sources and fields when hunting. Wading birds such as herons and egrets are also a potential threat where there is standing water that supports aquatic vegetation and wildlife. White-tailed deer and coyotes also represent a potential hazard to aircraft operations during takeoffs and landings.

BASH Plan. 1FW is the lead activity that prepares the BASH Plan. Drafts are formally staffed with 733 MSG (including CES and other installation staff) for comment before being finalized. The plan shall be consistent with the JBLE-E INRMP.

BASH Activities. Control of wildlife posing BASH risks occurs within the airfield fence line. Any need to control wildlife outside the fence line is requested through CEIE. INRMP preparation and implementation. New/revised INRMPs and the Annual INRMP Review Summaries are prepared by CEIE. These documents shall be staffed with 1FW for review and comment before being finalized.

Information exchanges. CEIE (through CES) and USDA-WS (through 1FW) assist each other regarding potential BASH risks and removal actions since tasks performed by either activity may be mutually beneficial. For example, removal of resident Canada geese by either USDA-WS or CEIE may support reducing BASH risks and reduce fecal matter deposition at physical fitness sites, parade fields and the golf course. Exchange of survey reports contributes to both activities' work. 1FW provides monthly USDA reports for activities USDA performed at JBLE-Eustis to 733 CES.

Habitat management. Projects to alter habitats at Felker Army Airfield are submitted to 733 CES for approval.

Pest management at Felker Army Airfield. All pest management activity is accomplished in accordance with the JBLE-E Integrated Pest Management Plan and approved by the IPMC.

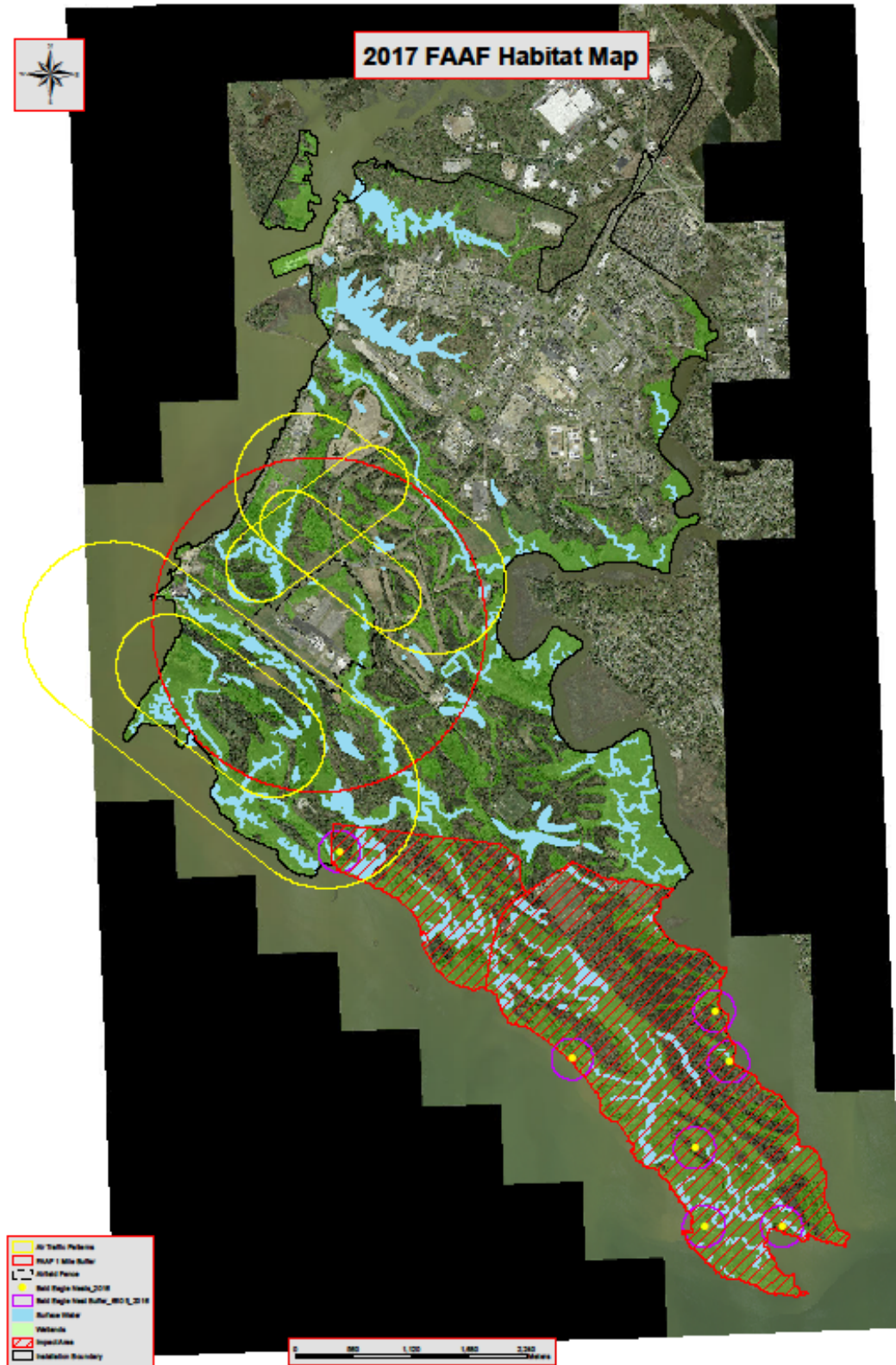


Figure 7-5. Military Aircraft Flight Map

7.12 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to USAF installations that are located along coasts and/or within coastal management zones. This section is applicable to this installation.

Program Overview/Current Management Practices

Coastal Zone Management Act. The [Coastal Zone Management Act](#) (CZMA) encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources. Though federal lands are excluded from state coastal management areas, activities on federal lands that are reasonably likely to affect any land or water use or the natural resources of designated coastal resources management areas must be consistent with the enforceable policies of the [Virginia Coastal Resources Management Program](#) (VCRMP). Consistency reviews are triggered for all federal actions inside the coastal zone and for actions outside the coastal zone that have the potential to affect Virginia's coastal uses and resources. All federal development projects inside the coastal zone are automatically subject to consistency review and require a consistency determination in accordance with 15 CFR 930.JBLE-Eustisis within the designated coastal resources management area (VDEQ 2002). An outline of Virginia's federal consistency review processes available on the VDEQ website at <http://www.deq.virginia.gov/eir/federal.html>. Project proponents are required to coordinate with CEIE regarding the preparation of Federal Consistency Determinations (FCD) in accordance with Virginia specifications and JBLE Instruction 32-101, Environmental Management.

FCDs. FCDs are submitted to the Virginia Department of Environmental Quality which then coordinates the document with other state and local agencies. The Commonwealth has 60 days by law to review these documents. In many cases FCDs are submitted as appendices to EAs or EIAPs. VCRMP. The VCRMP establishes policies and objectives to guide the use and development of coastal management areas to ensure their protection and preservation. Included are policies on fisheries management, subaqueous lands management, wetlands, primary dunes, point and non-point source water pollution, point and non-point source air pollution, shoreline sanitation, and coastal lands management.

Based on projected inundation, the following set of adaptation strategies have been identified for consideration (Table 2). Suggested adaptation projects are rated by their difficulty to implement and their relative efficacy. Ease of implementation is ranked from 1 to 3, with 1 being most difficult to implement and 3 being the easiest to implement. Efficacy is ranked from 1 to 3, 1 being the least effective and 3 being the most effective.

The ecological impacts related to adopting each of these projects is stated to be positive if no negative impacts are expected. If these projects are expected to have negative ecological impacts, they are rated one (being as low negative impacts) through three (being high negative impacts).

Table 7-2. Summary of adaptation strategies to mitigate potential SLR and SS inundation.

Strategy	Implementation	Efficacy	Ecological impacts	Ecological resources
Coastal Relocation	3	3	Site specific	Bronen, 2011
Controlled Overtopping	2	2	Positive	NRC, 2013
Saltwater Intrusion Barriers	2	3	Positive	USEPA, 2015
Sea Walls	3	3	2	Gittman, Scyphers, Smith, Neylan, & Grabowski, 2016
Storm Surge Gates	3	3	1	Tam, 2009

7.13 Cultural Resources Protection

Applicability Statement

This section applies to USAF installations that have cultural resources that may be impacted by natural resource management activities. This section is applicable to this installation.

Program Overview/Current Management Practices

Cultural resources are managed in accordance with the JBLE-Eustis Integrated Cultural Resources Management Plan. The primary connection between cultural and natural resources protection and management concerns coordination of work. In some cases, habitat management or restoration may involve excavation or other intrusive tasks that could affect cultural resources.

7.14 Conservation Awareness and Public Outreach

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

Natural resources and conservation education is a primary tool utilized to promote community awareness and participation. JBLE-Eustis accomplishes community inclusion through various avenues; community lectures, nature/conservation-based activities, and special events; information is distributed by using community working groups and electronic/paper media.

Earth Day. Earth Day is an annual conservation event on JBLE-Eustis and was initiated on the installation in 1992. Celebration extends involvement to civilian, military volunteers, and local children. Various activities are held that keep natural resources and environmental conservation at the forefront. Activities to include but not limited to shoreline clean ups, storm drain stenciling, environmental tours, tree plantings, miscellaneous contests, bio blitz, environmental surveys, etc. Shoreline Cleanups. JBLE-Eustis participates in multiple shoreline cleanups each year. Participation includes Clean the Bay Day and International Coastal Cleanup. Cleanups promote JBLE-Eustis awareness of environmental stewardship, conservation of our local waterways and parks. JBLE-Eustis encourages active duty and civilian participation to volunteer picking up along the James River and various lakes located within the installation.

Prohibited Practices/Activities

Biological organisms and their ecosystem relationships is very complex. Consequently, these functions must be monitored and managed properly. Without this the ecosystems can become damaged leading to disruption of military missions, damage to natural functions, damage to infrastructure, and increases risks to human health. To prevent these impacts the following practices and actions are strictly prohibited at JBLE-Eustis:

- Walking in or riding horses in wetland vegetation associated with the artificial wetlands along the entire length of the Harrison Road shoreline. These wetlands (that include vegetation) were constructed to prevent erosion of Harrison Road. Damage to or removal of the vegetation associated with this shoreline increases this risk.
- Off-road vehicle driving in wetlands, shorelines, beaches, forested areas, and streams.
- Allowing domestic pets such as dogs and cats to run loose. Dogs and cats must be on a leash, confined to homes or respective yards, retained in an appropriate animal kennel/carrier, or within the Dog Park.
- Intentionally or voluntarily releasing any sort of wild animal onto the installation. It is illegal to relocate native wildlife from a given location to JBLE-E. It is illegal to release or liberate non-native or exotic animals to include pets onto the installation.
- Intentionally or voluntarily releasing or liberating insects, other arthropods, or other invertebrate animals onto the installation. Examples include (but are not limited to) releasing butterflies for weddings or other events, and predatory insects into gardens.
- Intentionally or voluntarily releasing captive-raised frogs, toads, insects, or other organisms associated with school forums or any other activities.
- Intentionally or voluntarily releasing or abandoning domestic dogs or cats onto the installation.
- Intentionally or voluntarily removing any wildlife, other fauna (including but not limited to, insects [such as honey bees, other pollinators, caterpillars, or any insect species], crayfish, etc.), or animal parts (such as but not limited to skulls, feathers, turtle carapaces/plastrons, carcasses, tails, claws, talons, fur, etc.) from the installation except as authorized by JBLEI 32-102 regarding hunting and fishing.
- Cut down or remove trees without prior authorization by CEIE.
- Cut or remove forestry products or trees such as standing timber (dead or live), timber laying on the ground, logs, limbs, or sticks, or collect as firewood.

- Remove or otherwise collect herbaceous plants from the installation without prior authorization from CEIE.
- Create or operate a domestic cat colony on the installation (sometimes referred to as a “Trap-Neuter-Return colony”).
- Utilize crayfish, frogs (adults or tadpoles), or salamanders as fishing bait on the installation or while fishing from the Harrison Road shoreline.
- Harvest or remove any frog or toad species on the installation (such as frog gigging or collection for retention as pets or for sale).
- Capture, trap, collect or remove any native wild animal from the installation. Animals are defined as any vertebrate or invertebrate species that includes mammals, birds, reptiles, amphibians, arthropods (insects, crayfish, spiders, etc.), annelids, or other species.
- Kill, injure, capture or harass any wildlife or other fauna except as permitted installation recreational hunting and fishing policies as articulated in JBLEI32-102.
- Collect or trap minnows or other bait fish from Eustis Lake or Browns Lake.
- Discharge or discard refuse, soil, sediments, or any debris including vegetation debris into wetlands or streams.
- Cut or remove tree limbs or other native vegetation to camouflage duck blinds, other structures, etc.
- Remove, damage, tamper with or otherwise disrupt official government (or government contracted) animal traps or nets.
- Removing any fish from Eustis Lake or Browns Lake (all fish must be released back into these water bodies during fishing).

Collectively, these prohibitions are intended to prevent the following types of issues:

- Violation of federal or state law.
- Introduction of less than optimum genes into naturally occurring gene pools that could negatively affect the viability and health of a given species or population and in turn affect the natural community and the habitat.
- Alter the normal intraspecific competition into a detrimental outcome from saturating the biological system.
- Creation of pest issues that may affect other organisms and habitats including individual tree and forest health.
- Introduction of parasites or disease pathogens that could affect the natural populations or human health.
- Causing severe erosion or wetland fill that requires corrective action at a cost to the government.
- Compromising safety and other health concerns.

7.15 Climate Change Vulnerabilities

Vulnerability in this case refers to the degree to which an installation and its natural resources are susceptible to the impacts of changing climate conditions. JBLE-Eustis is expected to experience warmer and wetter climates, with substantial increases in average, minimum, and maximum temperatures and likely increases in precipitation. The Hampton Roads region, where JBLE-Eustis is located, is also one of the areas with the most rapidly eroding coastline and

increase in relative sea level in the country. JBLE-Eustis has experienced the effects of climate change particularly concerning shoreline erosion. The USACE prepared a shoreline study of the installation in 1993 highlighting several areas affected by this phenomenon (USACE, 1993). Much of the affected shoreline was along the James River. This included Harrison Road which was expected to be eventually lost and in approximately 2003, artificial wetlands were constructed along most of the length of the road. In 2015, Range Operations (ASA) reported serious erosion of the shoreline at Training Area 1 on Skiffes Creek. The area was further assessed with preparations of recommended correction utilizing living shoreline concepts. An environmental assessment was prepared for construction of a living shoreline in 2021.

This INRMP covers a 5-year period from June 2024 through June 2029. Consequently, a long-term examination of climate change vulnerabilities exceeds the scope of this INRMP. Significant alteration of the JBLE-Eustis environment is not expected during this plan period. However, shoreline erosion is expected to continue along portions of the James River and Skiffes Creek. Increased risks of flooding also remain possible with construction of additional impervious surfaces and loss of peripheral marsh habitat. Though no documented studies exist on the effects of rising temperatures contributing to increased forest pest insects or disease-vectoring arthropods issues, this issue may become more prevalent in the future.

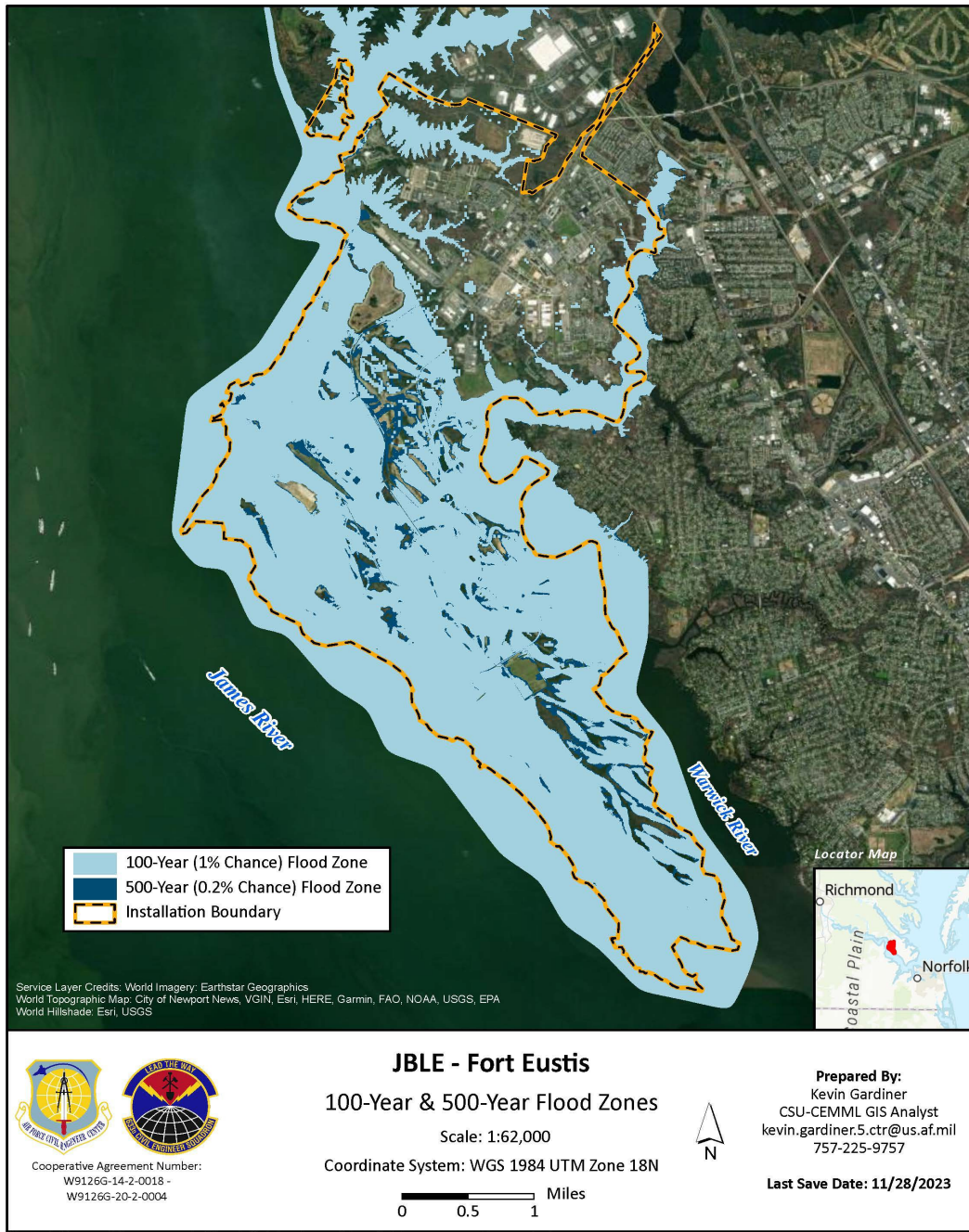


Figure 7-6. 100 and 500 Year Flood Zones on JBLE-Eustis.

7.16 Geographic Information Systems (GIS)

Applicability Statement

This section applies to all USAF installations that maintain an INRMP, since all geospatial information must be maintained within the USAF GeoBase system. The installation is required to implement this element.

Program Overview/Current Management Practices

Geographical Information System (GIS). A Geographic Information System (GIS) Database of natural resources data layers is maintained and updated by the Natural Resources Team for use on projects and activities related to the management of natural resources. Data layers are stewarded by the AFCE Environmental GIS Office and are updated annually at a minimum.

DRAFT

8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and supporting objectives to manage and protect natural resources while supporting the military mission. Goals express a vision for a desired condition for the installation's natural resources and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF missions, this section may list specific goals and objectives aimed at eliminating, reducing, or mitigating the effects of encroachment on military missions. These natural resources management goals for the future have been formulated by the preparers of the INRMP from an assessment of the natural resources, current condition of those resources, mission requirements, and management issues previously identified. Below are the integrated goals for the entire natural resources program.

The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement—Management Goals and Objectives

The overlap of similar management measures for different natural resources management issues is indicative of the interrelationship between the various components of an ecosystem. For example, significant portions of the training lands are forested and provide the cover required to support the military mission. In addition to being essential for the military mission, the condition of the forests directly influences the quality of wildlife habitat, outdoor recreation, and other components of the natural resources program. The condition of the forested watersheds also directly influences water quality, the condition of the fisheries, and sensitive habitats, such as the wetlands and conservation areas. These habitats are necessary to maintain or to increase the biodiversity at JBLE-Eustis and sustainment for long-term use.

Implementation of projects requires coordination with various organizations including AFCEC, other components of the 733d MSG including CES, FSS, and SFS as well as ASA, and 1FW. Additional consultation may be required with NOAA, USACE, USDA, USFWS, VDEQ, VDWR, VDCR, VDOF, VDNH, VIMS, VMRC, and other natural resources agencies and organizations. CEIE oversees all natural resources management projects identified in this INRMP unless contractor support is needed to complete a specific task. In these situations, CEIE develops contract specifications for project development, monitors contractor performance, and provides project oversight. Invasive plant species control, deer management, control of arthropod disease vectors, forest pest control and habitat improvements comprise the more significant tasks requiring resourcing to achieve a sustainable future.

GOAL 1: THE OVERARCHING GOAL IS TO FACILITATE SUSTAINMENT OF NATURAL AREAS FOR LONG-TERM USE.

The objectives established by CEIE for the natural resources management program are to maintain ecosystem viability across the entire installation, support the Sustainable Range Program and ensure overall sustainability of natural resources.

- Objective 1.1 All projects and actions shall integrate natural resources conservation into the planning phases and shall first assess use of existing disturbed areas before converting natural areas into permanently altered areas.*
- Objective 1.2 Provide realistic and healthy habitat in the training and non-training areas.*
- Objective 1.3 Conduct a natural resources management program that utilizes the principles of ecosystem management.*
- Objective 1.4 Use adaptive management techniques to provide the flexibility to adapt management strategies based on increased knowledge and data gained from monitoring programs and science literature.*
- Objective 1.5 Seek to maintain or increase the level of biodiversity of native species.*
- Objective 1.6 Protect forest resources from unacceptable damage and degradation resulting from insects and disease, animal damage, invasive species, and wildfire; provide occasional income; and manage the resources in a manner that supports the military mission.*
- Objective 1.7 Prevent the degradation of water quality, protect aquatic and riparian habitats, and identify and restore degraded habitats.*
- Objective 1.8 Protect soil resources from erosion and destabilization through prevention and restoration efforts.*
- Objective 1.9 Provide special protection and management that lead to the recovery of threatened and endangered species and protect species of special concern (as appropriate).*
- Objective 1.10 Protect rare and unique wildlife and plant species identified as state or locally rare through conservation measures to the maximum extent practical.*
- Objective 1.11 Protect the ecologically sensitive significant habitats located in the conservation areas on JBLE-Eustis.*
- Objective 1.12 Manage wildlife and fisheries resources within the principles and guidelines of ecosystem management to maintain diverse and productive habitats and viable populations of native species.*
- Objective 1.13 Provide outdoor recreational opportunities that avoid conflict with the military mission.*
- Objective 1.14 Provide a positive contribution to the community by offering informative and educational instruction and opportunities.*

GOAL 2: IDENTIFY SHORELINE EROSION ISSUES ASSOCIATED WITH THE INSTALLATION.

The objectives of shoreline management are to monitor areas where excessive shoreline erosion is occurring; evaluate the feasibility and effects (both positive and negative) of implementing BMPs to stabilize the shoreline; design, install, and maintain shoreline stabilization practices where it is determined that they will be effective in controlling erosion with minimal impacts on existing down shore or up shore habitats, and comply with regulations. Where excessive coastal erosion is occurring, the shoreline should be stabilized and repaired in a timely manner to avoid impacts to adjacent habitats or existing infrastructure.

VIMS, in cooperation with USACE and VDCR, completed a JBLE-Eustis Shoreline Management Plan in February 1997. This comprehensive shoreline management approach is necessary because of the high potential for shoreline erosion on JBLE-Eustis. Eight reaches of shoreline were identified in the plan and brief characterizations of erosion in the reaches were provided (VIMS 1997). The plan provided recommendations for BMPs to address shoreline erosion on the eight stream and river reaches on JBLE-Eustis. The Harrison Road Stabilization Project was initiated in 2003 to construct offshore breakwaters, create wetlands with dredge spoil, and employ headland control along the James River shoreline. Regulatory coordination for the FCD was conducted in accordance with the 1997 JBLE-Eustis Shoreline Management Plan. Placement of dredge spoil behind the breakwaters was conducted in 2004. Monitoring and maintenance activities were conducted in 2005-2008. Since 2008, approximately 700 additional plugs of *Spartina patens* were planted annually in this area as part of Earth Day and Boy Scout projects.

Objective 2.1 Develop comprehensive shoreline management plan.

GOAL 3 IMPROVE WATER QUALITY AND CONSERVE WETLAND RESOURCES.

Aquatic habitat management measures are directed towards maintaining healthy aquatic ecosystems. Similarly, riparian management measures are implemented to protect water quality and fisheries resources, with an emphasis on maintaining adequate riparian buffer areas. Wetland management actions at JBLE-Eustis are directed toward protecting existing wetlands, rehabilitating degraded wetlands, and (if applicable) restoring former wetlands.

- Objective 3.1 Maintain a complete inventory of wetlands on the installation and recertify this every 5 years with the USACE-Norfolk District in 2024.
- Objective 3.2 Retain all wetland permitting responsibility within the CEIE.
- Objective 3.3 Evaluate direct and indirect impacts to jurisdictional wetlands during all project planning review/development and formulate options for avoidance or mitigation. Ensure the design, construction, and maintenance of stream crossings in training areas provides maximum erosion protection; minimize adverse effects on wildlife, aquatic life, and their habitats; and maintain hydrologic processes and water quality (on-going: this is a review area for all projects).
- Objective 3.4 Utilize 2009 ephemeral pool study to update the ephemeral pool inventory by 2025 and to consider impacts to these resources during project review.

- Objective 3.5 Monitor for unauthorized (unpermitted) damage of wetlands/surface waters/ephemeral pools and implement corrective action accordingly (ongoing).
- Objective 3.6 Monitor and identify vegetation improvements for riparian habitats (ongoing).
- Objective 3.7 Reduce invasive species impacts on wetlands.

GOAL 4 IMPROVE TERRESTRIAL HABITATS FOR LONG-TERM SUSTAINABILITY

Terrestrial habitat management is conducted to manipulate habitats for the benefit of native wildlife, other native fauna, and native flora and to maintain or improve the biological diversity of wildlife, other fauna, and flora on the installation. In general, management actions focus on rehabilitating degraded areas to natural conditions and maintaining natural areas.

Forests on JBLE-Eustis are managed to maintain ecosystem viability and the forest cover required for military training and long-term sustainability. Historically, forest management objectives favored commercial production of loblolly pine. However, an ecosystem management approach to forest management will be followed to provide for the production of timber as well as enhancement of wildlife, biodiversity, outdoor recreation, soil and water conservation, air quality, and training missions. The primary commercial objective of the forest management program will be to produce high-quality pine and hardwood saw timber without adverse effects on ecosystem integrity and the military mission.

- Objective 4.1 Improve the commercial forest resources for long-term sustainability utilizing the 2021 Timber Inventory & Forest Management Plan.
- Objective 4.2 Determine risks of forest insect/arthropod pests.
- Objective 4.3 Improve urban forest resources for long-term sustainability.
- Objective 4.4 Reduce mowing requirements for unused, open areas, and fescue-dominated natural areas.

GOAL 5 INCREASE/IMPROVE THE BIODIVERSITY WHILE MANAGING WILDLIFE, FISHERIES, AND OTHER FAUNA ISSUES ON THE INSTALLATION.

The objectives of wildlife management are to maintain wildlife populations on JBLE-Eustis for biodiversity, periodically review/revise and implement a BASH plan, provide outdoor recreation, reduce risks of vehicular collisions with wildlife, reduce the risks of zoonotic disease transmission, and conduct nuisance animal control. In addition, focused species-specific surveys of wildlife species and populations are conducted to maintain records of game harvests, manage furbearers for predator management, conduct nuisance animal control, and enhance overall biodiversity on the installation. Incorporate insects, other arthropods, and other invertebrate taxa as significant components in an ecosystem-based philosophy.

- Objective 5.1 Ensure this goal is consistent with Goals 3 and 4 and related objectives.
- Objective 5.2 Monitor wild turkey population.

- Objective 5.3 Perform faunal surveys for specific vertebrate species based on existing surveys and observations, and continue macroinvertebrate species annually.
- Objective 5.4 Perform wildlife surveys and analyses in the event of emergencies, zoonotic disease outbreaks, significant changes in invasive vertebrate species statuses, identification of federally listed species not previously documented, to support special project requirements or other unexpected critical situations.

GOAL 6 INTEGRATE PEST MANAGEMENT AND PESTICIDE USE WITH NATURAL RESOURCES MANAGEMENT.

Integrated pest management (IPM) activities at JBLE-Eustis include identification and control of invasive and undesirable vegetation, native and invasive pest arthropods, disease-vectoring arthropods, and nuisance vertebrate species in training areas, recreational areas such as the golf course; turf management at the golf course; nuisance animal control; forest and landscape pest control; urban pest control, and invasive species control.

IPM is conducted to provide maximum pest control at the installation while minimizing the use of pesticides. The objectives of IPM are to use mechanical and physical control (physical removal and exclusion of pests), cultural control (altering specific environmental features to make an area less suitable for or attractive to pests), and biological control (use of natural predators to control a pest) methods before using chemical control methods (pesticides). Pest control operations are implemented in accordance with the JBLE-Eustis Integrated Pest Management Plan.

GOAL 7 MANAGE WILDLAND FIRE PROGRAM.

Fire management at JBLE-Eustis consists of wildfire prevention and control, and use of prescribed fire for habitat improvement. Historically, wildfires have not been a major concern because high soil moisture, wetlands, and a road and trail network that could prevent large, damaging fires from developing. However, the potential exists based on small arms fire combined with conditions of extended drought and high densities of fire fuel such as (but not limited to) large stands of common reed (*Phragmites australis*). Firebreaks at the installation were located primarily behind small arms ranges, where the danger of accidental fire is greatest. An adequate system of firebreaks is essential for controlling wildfires and protecting forest resources.

GOAL 8 FOSTER CONSERVATION AWARENESS ACROSS THE ISNTALLATION TO SUPPORT LONG-TERM SUSTAINMENT.

The objective of conservation awareness is to foster understanding and awareness of the environment through educational programs. The conservation awareness program sponsors or cooperates in a number of other outreach programs that build community ties and partnerships and that teach environmental responsibility in the community.

Conservation education is instrumental in creating the conditions needed to conduct sound, professional practices that produce both user opportunities and resources protection. Conservation

education also promotes awareness of critical natural resource projects and an appreciation of the rationale behind them.

Objective 8.1 Retain topics of natural resources and IPM in Advanced Environmental Management Courses.

Objective 8.2 Provide opportunities for conservation and IPM awareness.

Objective 8.3 Provide environmental information to all base personnel and contractors through use of available media.

8.1 Projects

Annually Recurring Natural Resource Projects Requested Through ACES 2024-2029

Equipment purchase & maintenance support. This is a must fund, recurring project to maintain an 18-ft flat-bottom 90-hp motor/boat, three (3) Kubota tractors, three (3) bush hog mowers, four (4) water sprayers, six (6) chainsaws, all-terrain vehicle, various tools, and ancillary equipment, or to replace nonfunctional/old equipment or new items deemed necessary by installation natural resources staff.

Estimate out years FY 25-26: \$12,000 annually.

Estimate out years FY 27-29: \$15,000 annually.

Supplies for conservation operation. Various expendable supplies unique to natural resources management are needed annually. These may include roost/nesting boxes (for wood ducks, bats and purple martins), wetland marking tape, forestry marking tape, tree marking paint, batteries, silt fencing, signage, specialized marking flags, panel/lindgren funnel traps, work gloves, snake tongs, anti-bite gloves, animal carriers, boots, disposable gloves, field notebooks, lumber, stakes, light traps, animal traps, tools, etc.

Estimate out years FY 25-26: \$10,000 annually.

Estimate out years FY 27-29: \$12,000 annually.

Invasive species management. Invasive species management requires annual implementation of control techniques. Currently, invasive vegetation constitute the greatest issues; however, conditions and actual fauna or flora species can change annually. There are several invasive plant species that affect mission requirements that include common reed, tree of heaven, golden bamboo, kudzu, Chinese privet, autumn olive, English ivy, Johnson grass and Japanese stiltgrass. The most common mission impact is to dismounted troop movement restriction, overgrowth into gravel training trails and installation infrastructure and to a lesser extent, reducing the economic and ecological value of existing timber stands.

Estimate out years FY 25-26: \$100,000 annually.

Estimate out years FY 27-29: \$120,000 annually.

Forest/Habitat management. JBLE-Eustis has over 2,700 acres of commercial forest resources and early successional areas that are affected by various unforeseen abiotic and biotic factors particularly weather/climatic conditions (droughts, extreme temperatures, excessive rainfall, insects, fungal diseases, bald eagle nesting, and human activities).

Funding provides for tree seedling and sapling planting to replace damaged or lost trees as well as warm season grasses, wildflowers, and forbs to maintain soil continuity as well as improve pollinator habitat through successional processes. Additionally, this funding supports control of undesirable vegetation and removal or trimming of hazard trees in commercial forested areas that could affect training or other military missions, conduct other timber stand improvements, and reforestation to maintain habitats for continued military use.

Estimate out years FY 25-26: \$250,000 annually.

Estimate out years FY 27-29: \$260,000 annually.

Management of nuisance/hazardous wildlife. Several wildlife species exist on the installation that can cause physical damage to property, create unsanitary conditions near operations and contribute to several zoonotic disease (rabies, tick-borne pathogens, mosquito-borne pathogens) maintenance in the installation environment. These include (but are not limited to) resident Canada geese, whitetail deer, coyotes, European starlings, brown-headed cowbirds, common grackles, raccoons, bats, and foxes and other species. Currently, evening bats (and possibly other bat species) frequent a contract warehouse (BLDG 1610) despite several attempts to seal the building. Numerous requests for funding were submitted over the course of several years. Some vertebrate species such as nutria and mute swans require surveillance to prevent establishment. Biotic factors lead to unpredictable incidents and unexpected situations frequently arise. Actual annual needs vary because species, conditions and conflicts can change annually.

Estimate out years FY 25-26: \$30,000 annually.

Estimate out years FY 27-29: \$15,000 annually.

Execute a DoD Legacy Program Grant to develop a JBLE-Eustis Shoreline Management Plan. JBLE-Eustis obtained a DoD Legacy Program grant to prepare a shoreline management plan executed by Virginia Institute for Marine Science. The project will develop a holistic nature-based solutions shoreline management plan for the 26 miles of shoreline at Fort Eustis. This will include consultation with federally recognized tribes, Commonwealth of Virginia agencies, USACE, NOAA, National Park Service (NPS), US Forest Service (USFS), city of Newport News and James City County. CY24-25.

ITAM Funds

Military training in designated training areas requires maintenance of these training lands. ITAM funding used to perform these tasks via the Department of the Army, G3 via IMCOM, G7. The portion of the ITAM funding for fiscal years 2025 through 2029 used to support the natural resources within training areas is managed by the Range Operating Agency. Budget details are presented in separate ITAM Annual Work Plans prepared in accordance with the Range Control Master Plan and focus on site restoration from maneuver/training-related damage, beach replenishment, vegetation management, and soil conservation.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

Natural resource projects have been addressed to AFCEC/IST for inclusion into funding and execution of these projects are required to implement this INRMP. Changes in scopes of work and subsequent funding requirements may change during the plan years due to mission changes, lack of funding or execution during some plan years, results following eventual completion of the

forest inventory (the last inventory is now more than 10 years old), new invasive species becoming established, changes in federal species listing, or other unforeseen issues.

9.1 Natural Resources Management Staffing and Implementation Staffing

The professionally trained natural resources conservation personnel at JBLE-Eustis, in cooperation with other installation personnel, are necessary to implement this INRMP. The natural resources management staff at JBLE-Eustis are assigned within CEIE and are listed in [Table 9-1](#).

Table 9-1. Natural Resources Management Staff at JBLE-E

Number	Position	Status
1	Team Lead/Natural Resources Program Manager/Habitat Manager (Biological Scientist/GS-0401-12)	Full-time, permanent
1	Invertebrate Fauna Biologist/Integrated Pest Management Coordinator (Biological Scientist/GS-0401-12)	Full-time, permanent
1	Wildlife Biologist JBLE I 32-102 Program Manager (Wildlife Biologist/GS-0486-11)	Full-time, permanent
2	Conservation Law Enforcement USFWS Federal Wildlife Off.	Full-time, permanent

Command support is essential for implementation of this INRMP. The 733d Mission Support Group Commander and other personnel in command positions at JBLE-Eustis shall fully support this INRMP to ensure the long-term sustainability of natural resources and the military mission. Subject to funding, CEIE might find it necessary to hire temporary labor (i.e., seasonal employees, university students, outside agency reimbursable employees) to assist in the completion of some projects and tasks. However, the permanent natural resources management professionals provide the foundation, continuity, and fulfill the supervisory roles necessary to continue the successful natural resources program at JBLE-Eustis.

Implementation of Funding Options

The natural resources program at JBLE-Eustis receives financial support from appropriated funds (e.g., operations and maintenance) and funded reimbursements (forestry) and user fees (hunting and fishing). The use of funded reimbursements and user fees is restricted by Federal law. Funded reimbursements can be used only for forest management-related expenses, and user fees may be used only to fund projects related to fish & wildlife management. Expenses not directly associated with timber management or with fish and wildlife management activities must be funded from appropriated funds.

Forestry Funds. Managing the installation forest resources is particularly challenging because the installation is small, and it must maintain healthy forests to meet military/Army training

requirements as well as prevent soil and shoreline erosion. Additionally, the installation lacks sufficient forest acreage to use harvest proceeds as a primary means to fund forest management projects. Consequently, funding for most forest management projects must be obtained via appropriated funding. However, some commercial timber sales do occur more typically as a result of construction projects. Commercial timber sales are coordinated through AFCEC. Shortfalls between revenues generated by forestry activities and the funds required to operate the forestry program may, if money is available, come from the DoD Forestry Reserve Account. Otherwise, shortfalls must be appropriated directly from the Operations and Maintenance (O/M) account.

Fish and Wildlife Management Reimbursement Funds. The Sikes Act (16 USC Part 670a(b)(3)(B) permits reimbursement of hunting and fishing (and other outdoor recreation) fees to the installation. Fees associated with fish and wildlife are collected into the 57 5095 accounting classification and the AFCEC/CZ sends these fees back to JBLE-Eustis in the 57X5095 appropriation. These funds are solely for protection, conservation and management of fish and wildlife (which includes habitat improvement and related activities) per AFI 32-7064 (Section 16.3.4). These funds are not for the construction of recreational structures such as duck blinds or fishing piers (16 USC § 670a-f).

9.2 Monitoring INRMP Implementation

At the end of the annual review process, the Natural Resources and IPM Team Lead/Natural Resources Manager submits an annual review summary to the Commander, 633d ABW (or Commander, 733 MSG when so delegated) articulating the outcome of the review which includes insight on the following areas:

- Projects have been budgeted for the future.
- Status of required trained natural resources positions.
- Projects and activities for the upcoming year have been identified and are included in the INRMP.
- All required coordination with the U.S. Fish and Wildlife Service, National Oceanic & Atmospheric Administration, and Virginia Department of Game and Inland Fisheries have occurred.
- Any significant changes in the installation's mission requirements or its natural resources have been identified.
- Any significant issues related to natural resources management or losses of natural resources that have been identified.
- Accomplishment of natural resource-related projects.

9.3 INRMP Annual Review and Update Requirements

The INRMP requires annual review, IAW DoDI 4715.03 and AFMAN 32-7003, to ensure the achievement of mission goals, verify the implementation of projects, and establish any necessary new management requirements. This process involves installation natural resources personnel and external agencies working in coordination to review the INRMP. If the installation mission or any of its natural resources management issues change significantly after the creation of the original

INRMP, a major revision to the INRMP is required. The need to accomplish a major revision is normally determined during the annual review with USFWS, the appropriate state, and NOAA (if required). The NRM/POC documents the findings of the annual review in an INRMP Annual Review Summary and obtains signatures from the coordinating agencies on review findings. By signing the INRMP Annual Review Summary, the collaborating agency representatives assert concurrence with the findings. If any agency declines to participate in an on-site annual review, the NRM submits the INRMP for review along with the INRMP Annual Review Summary document to the agency via official correspondence and request return correspondence with comments/concurrence.

The annual review process discussed above serves as a means of monitoring the implementation of the INRMP to include accomplishments, issues, and revisions to the INRMP. The final Summary is forwarded to the 733 MSG Commander for signature. It is then posted in MICT, eDASH, and the JBLE website (<https://www.jble.af.mil/Units/Army/Eustis-Environmental/>). The Summary articulates the outcome of the review which includes insight on the following areas:

- Projects have been budgeted for the future.
- Status of required trained natural resources positions.
- Projects and activities for the upcoming year have been identified and are included in the INRMP.
- All required coordination with the U.S. Fish and Wildlife Service, National Oceanic & Atmospheric Administration, and Virginia Department of Wildlife Resources have occurred.
- Any significant changes in the installation's mission requirements or its natural resources have been identified.
- Any significant issues related to natural resources management or losses of natural resources that have been identified.
- Accomplishment of natural resource-related projects.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source and priority for implementation. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows:

- **High:** The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the USAF is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a “Benefit of the Species” determination necessary for Endangered Species Act (ESA) Sec 4(a)(3)(B)(i) critical habitat exemption.
- **Medium:** Project supports a specific INRMP goal and objective and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112, *Exotic and Invasive Species*. However, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within the programmed year due to other priorities.
- **Low:** Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or supports long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

*Natural Resources standard titles by Presidential Budget (PB) 28 code (excluding CZT/CZC titles).

INRP	MMA	T&E	MNRA	WTLD
P&F, CN	Mgt, Species	Mgt, Habitat	Compliance Public Notification	Mgt, Wetlands / Flood Plains
Interagency/Intra-agency, Government, Sikes Act	Interagency/Intra-agency, Government, Sikes Act	Mgt, Species	Plan Update, Other	Monitor Wetlands
Interagency/Intra-agency, Government, Sikes Act, CLEO	Outsourced Environmental Services, CN	Mgt, Invasive Species	Recordkeeping, Other	Interagency/Intra-agency, Government, Sikes Act
Outsourced Environmental Services, CN	Supplies, CN	Mgt, Nuisance Wildlife	Outreach	Outsourced Environmental Services, CN
Supplies, CN	Supplies, CN, CLEO	Interagency/Intra-agency, Government, Sikes Act		
Supplies, CN, CLEO	Vehicle Leasing, CN	Interagency/Intra-agency, Government, Sikes Act, CLEO		
Equipment Purchase / Maintain, CN		Outsourced Environmental Services, CN		
Vehicle Leasing, CN		Supplies, CN		
Vehicle Fuel & Maintenance, CN		Supplies, CN, CLEO		
Mgt, Wildland Fire		Equipment Purchase / Maintain, CN		
Plan Update, INRMP		Vehicle Leasing, CN		

*Natural Resources standard titles by Presidential Budget (PB) 28 code (excluding CZT/CZC titles).

INRP	MMA	T&E	MNRA	WTLD
Plan Update, Other		Vehicle Fuel & Maintenance, CN		
Mgt, Habitat		Plan Update, Other		
Mgt, Species		Environmental Services, CN		
Mgt, Invasive Species				
Mgt, Nuisance Wildlife				
Recordkeeping, Other				
Environmental Services, CN				

* INRP-Integrated Natural Resources Program
 MMA-Marine Mammal Protection Act
 MNRA-Miscellaneous Natural Resources Activities
 T&E-Threatened & Endangered Species
 WTLD-Wetland
 CN-Conservation

Natural resources Annual Work Plans also involve several on-going projects performed by CEIE Natural Resources & IPM Team staff. These include the following:

- Monitor execution of the programmed projects noted above (ANNUALLY).
- Maintenance of animal carcass disposal area (ANNUALLY).
- Maintain early successional/pollinator habitat and monitor fauna species use (ANNUALLY).
- Continue hazard tree inventory and assessment (ANNUALLY).
- Perform whitetail deer surveys and management (ANNUALLY).
- Perform wild turkey surveys and management (ANNUALLY).
- Perform bald eagle nest surveys via aircraft platforms (ANNUALLY).
- Document arthropod fauna (including forest pests) and update existing inventory (ANNUALLY).
- Continue management of the hunting and fishing program (ANNUALLY).
- Respond to and document urban wildlife incidents and conflicts (ANNUALLY).

- Execute outreach support for mission partner events (ANNUALLY).
- Continue macroinvertebrate data collection to include implementing a routine forest insect survey and incorporate into INRMP/annual review summaries (ANNUALLY).
- Evaluate feasibility of bobwhite quail reintroduction.
- Continue to provide review of AF Form 813s, AF Form 332s, EA drafts, and other documents (ANNUALLY).
- Prepare Joint Permit Applications (as appropriate) and ensure compliance with existing wetland permits (ANNUALLY).
- Obtain/file MBTA/Bald Eagle permits (ANNUALLY).
- Attend and support Rabies Advisory Boards (RAB) (ANNUALLY).
- Continue to evaluate appropriate cross-referencing the INRMP and IPMP (ANNUALLY).
- Evaluate two historical Conservation Sites (Warwick River North and South Seeps).
- Timber to Early Successional Habitat Conversion. In support of the AF Pollinator Action Plan and timber stand improvements described in section 6 of this review, approximately 75 acres of overstocked and over mature timber was identified that needed removal or maintenance in the form of timber sale and re-forestation. At the end of the review period the timber had been mapped and a timber cruise (determinations of volume and revenue potential) has begun. Removal, thinning, and reforestation of these tracts were prescribed by the timber inventory complete during the review year.
- Reduce reliance on invasive species programmed funds. Historically Invasive species control funding has been sporadic and the NR&IPM Team has responded by increasing the amount of “in-house” invasive species management occurs. Dependable, programmatic invasive species management funding is the most efficient and effective means of controlling invasive species and undesirable vegetation. However, the NR&IPM Team is posturing to augment invasive species contracted work when funded and use a targeted approach to maintaining current invasive species management goals between contracts of when funding is not received. This will likely lead to an increase in conservation supplies and equipment funding needs but will increase the effectiveness of INRMP implementation into the future.
- Obtain Approved Surveyor Certification for Listed Bat Species. USFWS defines Range-wide Survey Guidelines for several threatened or endangered bat species. Within these guidelines are required minimum level of effort (LOE) of surveillance, and protocols to maximize detection and required qualifications and approvals to become an approved bat surveyor. Currently, there are few local approved bat surveyors, and all would require pre-programmed funding. Unfortunately, many projects and activities that support the JBLE-Eustis mission omits bat surveillance in pre-planning steps. Obtaining the equipment and certifications to meet minimum LOE would allow the installation to accurately monitor and provide bat data during the EIAP as well as aid in conservation efforts for listed bat species. This both reduces costs, improves data collection, and increases the effectiveness of bat conservation measures across the region.
- Create Internal Eastern Black Rail Assessment Capability. Similarly, to approved surveyor and LOE process described in section 11.6, USFWS is proposing regional best management practices (BMP) to mitigate habitat damage and take of Eastern black rails. The ability to detect physical presence or deduce probable absence of eastern black rail when conducting Section 7 Consultations would greatly

improve regional conservation measures and reduce costs of planning level surveys to the installation. Formal LOEs and guidelines are not expected to publish in the near future, but a thorough understanding of detection techniques and habitat utilization of eastern black rails would allow the NR&IPM Team to collect sufficient Section 7 Consultation data.

- Design turtle shell fungal disease project based on two suspect cases found in woodland box turtles in Training Area 1 and 2 (FY26).
- Develop new snake fungal disease monitoring project (FY26).
- Organize partnering with Frog Watch USA (FY 24).
- Complete an updated habitat assessment of Goose Island (CY24).
- Execute new jurisdictional wetland delineation once validated by USACE (FY24).
- Execute macroinvertebrate and flora surveys as part of FY 2022 EQ funding (contractors yet to be identified by USFWS) (CY24).
- Participate in/host the Strategic Environmental Research and Development Program (SERDP) project #RC24-C3-4117, “Promoting resilience of spotted turtle populations on DOD installations” through the University of Georgia’s Savannah River Ecology Laboratory. (CY 24 – 29)
- Update ephemeral pool data.
- Participate in/assist with Tidewater Sentinel Landscape program (CY24-29).
- Participate in/assist with VIMS living shoreline assessment (CY 24).

11.0 REFERENCES

11.1 Standard References (Applicable to all USAF installations)

- [AFMAN 32-7003, Environmental Conservation](#)
- [Sikes Act](#)
- [eDASH Natural Resources Program Page](#)
- [Natural Resources Playbook](#)
- [DoDI 4715.03, Natural Resources Conservation Program](#)
- [AFI 32-1015, Integrated Installation Planning](#)
- [AFI 32-10112, Installation Geospatial Information and Services \(IGI&S\)](#)

11.2 Installation References

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all USAF installations)

[eDASH Acronym Library](#)

[Natural Resources Playbook—Acronym Section](#)

[U.S. EPA Terms & Acronyms](#)

12.2 Installation Acronyms

AATD	Aviation Applied Technology Directorate
ABW	Air Base Wing
ACA	Army Contracting Agency
ACES	Automated Civil Engineer System
ADC-WS	Animal Damage Control-Wildlife Services
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFPD	Air Force Policy Directive
AFRIMS	Air Force Records Management System
AIT	Advanced Individual Training
AMC	Army Materiel Command
ANSI	American National Standards Institute
ASA	Army Support Activity
ATSC	Army Training Support Center
BASH	Bird/Wildlife Aircraft Strike Hazard
BBC	Belfour Beattie Communities
BGEPA	Bald and Golden Eagle Protection Act
BLDG	Building
BMP	Best Management Practice
BOS	Base Operating Services
BR	Business Rule
BRAC	Base Realignment and Closure
BTRACS	Ballistics Test Range
CAPS	Cooperative Agricultural Pest Survey
CBP	Chesapeake Bay Program
CEIE	Environmental Element
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineer Squadron
CFR	Code of Federal Regulations
CHD	Cargo Handling Division
CLEO	Conservation Law Enforcement Officer
CMF	Career Management Area
CN	Conservation

CWA	Clean Water Act
CZ	Environmental Directorate
CZMA	Coastal Zone Management Act
DBH	Diameter at Breast Height
DMAP	Deer Management Assistance Program
DoD	Department of Defense
DoDI	Department of Defense Instruction
DPOP	Deer Population Reduction Program
DPS	Distinct Population Segment
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EMP	Environmental Management Plan
EMS	Environmental Management System
ENRD	Environmental & Natural Resources Division
EO	Executive Order
ERP	Environmental Restoration Program
FCD	Federal Consistency Determination
FE	JBLE-Eustis
FEDMMA	Fort Eustis Dredge Material Management Area
FFA	Federal Facilities Agreement
FORSCOM	Forces Command
FR	Federal Register
FSS	Force Support Squadron
FW	Fighter Wing
GCN	Greatest Conservation Need
GIS	Geographic Information System
GSU	Geographically Separated Unit
HD	Hemorrhagic Disease
HEAT	HMMWV Egress Assistance Trainer
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HQ TRADOC	Training and Doctrine Command Headquarters
IAW	In Accordance With
IET	Initial Entry Training
IGI&S	Installation Geospatial Information and Services
IMCOM	Installation Management Command
INRMP	Integrated Natural Resources Management Plan
INRP	Integrated Natural Resources Program
IPaC	Information, Planning and Consultation
IPM	Integrated Pest Management
IPMC	Installation Pest Management Coordinator
IPMP	Integrated Pest Management Plan
IRP	Installation Restoration Program
ISA	International Society of Arboriculture
ISO	International Organization for Standardization
IST	Installation Support Team
ITAM	Integrated Training Area Management

JBLE-E	Joint Base Langley-Eustis
JBLEI	Joint Base Langley-Eustis Instruction
JLOTS	Joint Logistics Over the Shore
LAFB	Langley Air Force Base
LOTS	Logistics Over the Shore
LRAM	Land Rehabilitation and Maintenance
MAHC	McDonald Army Health Center
MBTA	Migratory Bird Treaty Act
MEDDAC	Medical Command
METL	Mission Essential Training List
MHE	Material Handling Equipment
MILCON	Military Construction
MMA	Marine Mammal Protection Act
MMRP	Military Munitions Response Program
MNRA	Miscellaneous Natural Resources Activities
MOS	Military Occupational Skills
MOUT	Military Operations in an Urban Terrain
MSG	Mission Support Group
MSL	Mean Sea Level
NBC	Nuclear, Biological & Chemical
NCOES	Non-Commissioned Officer Education System
NEPA	National Environmental Policy Act
NER	Northeast Region
NETCOM	Network Enterprise Technology Command
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRM	Natural Resources Manager
NWI	National Wetland Inventory
NWP	Nationwide Permit
O/M	Operations and Maintenance
OPR	Office of Primary Responsibility
OPSEC	Operations Security
OSD	Office of the Secretary of Defense
PA	Public Affairs
PAO	Public Affairs Office
PL	Public Law
POC	Point of Contact
RCI	Residential Community Initiative
RCRA	Resource Conservation and Recovery Act
RDS	Records Disposition Schedule
RIFA	Red Imported Fire Ant
RMA	Resource Management Area
ROA	Report of Availability
RP	Regional Permit

RPA	Resource Protection Area
RTLA	Range and Training Land Assessment
SAV	Submerged Aquatic Vegetation
SFD	Snake Fungal Disease
SFS	Security Force Squadron
SHPO	State Historic Preservation Office
SJA	Staff Judge Advocate
SME	Subject Matter Expert
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program
SRTA	Short Range Training Ammunition
STALZ	Sling Load Training Area and Landing Zone
SWAP	State Wildlife Action Plan
T&E	Threatened & Endangered Species
TOC	Tactical Operations Center
TRADOC	Training and Doctrine Command
TRI	Training Requirements Integration
TSI	Timber Stand Improvement
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USARC	United States Army Reserve Center
USATCFE	United States Army Transportation Center & Fort Eustis
USATSCH	United States Army Transportation School
USC	United States Code
USDA	United States Department of Agriculture
USDA-WS	United States Department of Agriculture-Wildlife Services
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VA	Virginia
VCRMP	Virginia Coastal Resources Management Program
VDACS	Virginia Department of Agriculture & Consumer Services
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VDNH	Virginia Division of Natural Heritage
VDOF	Virginia Department of Forestry
VDWR	Virginia Department of Wildlife Resources
VIMS	Virginia Institute of Marine Science
VMRC	Virginia Marine Resources Commission
VPDES	Virginia Pollutant Discharge Elimination System
WFMP	Wildland Fire Management Plan
WTLD	Wetland

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all USAF installations)

<https://usaf.dps.mil/teams/10041/CEPlaybooks/NRM2/Pages/PlaybookProcesses.aspx?PrintOrder=128>

13.2 Installation Definitions

Active Nest - A nest where an adult was seen in incubating or brooding position, a chick or egg was seen or found in the nest, or the nest was newly constructed or repaired.

Adventive species. Refers to a nonnative plant or animal found in an area which is outside its historical geographic range. An introduced species that may or may not pose impacts to the local ecology.

Animal. Defined as any vertebrate or invertebrate species that includes mammals, birds, reptiles, amphibians, arthropods (insects, crayfish, spiders, etc.), annelids (segmented worms), or other species.

Arthropod. An invertebrate animal characterized as having a chitinous exoskeleton, bilateral symmetry, and paired/jointed appendages. Insects, spiders, mites, centipedes, millipedes, crabs, lobsters, crayfish, and similar organisms are representative arthropods.

Conservation. Procedures and methods intended to manage natural resources for long-term sustainability.

Ecology. A discipline of the biological sciences that examine the relationships among organisms and organisms and their physical environment.

Ecosystem. A defined biological community of interacting organisms and their physical environment.

Ephemeral pool. A defined area that collects precipitation (rainfall or snowmelt) temporarily in the winter and spring usually drying up by summer and lacks predatory fish.

Fauna. Refers to vertebrate and invertebrate animal life.

Floodplain. A generally flat area of land adjacent to a river.

Flora. Refers to plant organisms.

Forest. A forest is a large tract of land heavily populated by trees constituting the largest land ecosystem and various types (boreal, tropical, temperate).

Habitat. A defined area containing abiotic attributes and functions as area in which plant and animal species reside.

Hydrophytic. Plants that grow only in or on water.

Hematophagous. An animal that feeds on blood. For the purposes of this INRMP, such animals are arthropods such as ticks, mosquitoes, and other biting flies.

Integrated Pest Management (IPM). A planned program, incorporating continuous monitoring, education, record-keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. IPM uses targeted, sustainable (effective, economical, environmentally sound) methods including habitat modification, biological control, genetic control, cultural control, mechanical control, physical control, regulatory control, and where necessary, the judicious use of least-hazardous pesticides (DoD Instruction 4150.07).

Invasive species. A nonnative plant or animal that adversely affects native organisms or the habitat.

Invertebrate. Any animal species lacking an internal skeleton or vertebral column (backbone). Typically refers to arthropods, worms, slugs, snails, nematodes, clams, and leeches.

Macrophyte. Plants growing in or near water and is either emergent, submergent, or floating.

Natural resource. Natural resources include game wildlife, non-game wildlife, other fauna (such as invertebrate organisms), habitats (surface water [primarily streams/creeks and ponds], tidal and nontidal wetlands, ephemeral pools, forested areas, early successional areas, urban forests, soils, riparian areas, and shorelines), and plants/vegetative communities associated with these habitats, commercial timber/forest products, soils and land area.

Wetland. Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are transitional areas between open water and dry land and are often found along bays, lakes, rivers and streams. Some are drier than others and may have standing water or saturated soil conditions only during part of the year. Examples include bottomland forests, swamps, bogs, marshes, wet meadows and seasonal wet woods. (USACE).

Wetland Types. A wetland community based on certain physical and flora characteristics based on Cowardin et. al 1979 (Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service. FWS/OBS-79/31. Washington, DC.

- Estuarine Unconsolidated Bottom (Open Water) [E1UB]. Wetland & deepwater habitats with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%.

- Estuarine Emergent Wetland (E2EM). Deepwater tidal habitats and adjacent tidal wetlands. Usually, semi-enclosed by land but have open, partly obstructed or sporadic access to open ocean. Common reed (*Phragmites australis*) is the common vegetation (monoculture) in these habitats at JBLE-Eustis.
- Estuarine Persistent Wetland (E2EM1). Deepwater tidal habitats and adjacent tidal wetlands. Usually, semi-enclosed by land but have open, partly obstructed or sporadic access to open ocean. Dominant vegetation is herbaceous and non-woody plants. These types of habitats at JBLE-Eustis consists of smooth cordgrass (*Spartina alterniflora*), big cordgrass (*Spartina cynosuroides*), and saltmeadow cordgrass (*Spartina patens*) along with some chairmakers bulrush (*Schoenoplectus americanus*), needlegrass rush and cattail (*Typha* spp.).
- Estuarine Forested Wetland (E2FO). Wetlands dominated by woody vegetation with sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), white oak (*Quercus alba*), and black oak (*Quercus velutina*). Some loblolly pine (*Pinus taeda*) may exist but is not dominant in these wetlands. Deepwater tidal habitats and adjacent tidal wetlands. Usually, semi-enclosed by land but have open, partly obstructed or sporadic access to open ocean.
- Estuarine Forested Broad-leaved Deciduous Wetland (E2FO1). Wetlands dominated by broad-leaved deciduous woody vegetation with sweet gum, red maple, white oak, and black oak. Some loblolly pine may exist but is not dominant in these wetlands. Characterized as hydrophytic vegetation community.
- Estuarine Forested Needle-leaved Evergreen Wetland (ESFO4). Wetlands dominated by needle-leaved evergreen woody vegetation particularly loblolly pine at JBLE-Eustis.
- Rocky Shore (rubble) [E2RS2]. Wetlands having less than 75% area cover of bedrock but stones and boulders alone or in combination with bedrock cover 75% or more of the area. Macrophytic plants cover less than 30% of area.
- Estuarine Scrub-Shrub Broad-leaved Evergreen Wetland (E2SS3). Wetlands dominant woody vegetation less than 20 feet height typically shrubs. These habitats at JBLE-Eustis are dominated by wax myrtle (*Morella cerifera*).
- Estuarine Unconsolidated Shore (Sand) [E2US2]. Wetlands characterized with substrates lacking vegetation except for pioneer plants established by favorable conditions.
- Lacustrine Unconsolidated Bottom (Open Water) [L1UB]. Wetlands and deepwater habitats with at least 25% cover of particles smaller than stones and vegetative cover less than 30%. These include ponds and “lakes” at JBLE-Eustis.
- Palustrine Emergent Wetland (PEM). Non-tidal freshwater wetlands dominated by emergent hydrophytes where the salinity levels are below 0.5.
- Palustrine Emergent Permanent Wetland (PEM1). Non-tidal freshwater wetlands dominated by emergent hydrophytes where the salinity levels are below 0.5 dominated by herbaceous and non-woody plants.
- Palustrine Forested Wetland (PFO). Non-tidal freshwater wetlands dominated by broad-leave woody vegetation with salinity levels are below 0.5.
- Palustrine Forested Broad-leaved Deciduous Wetland (PFO1). Non-tidal freshwater wetlands dominated by broad-leave woody vegetation having minimum of 20-foot height and 3 inches diameter with salinity levels are below 0.5.

- Palustrine Forested Needle-leaved Evergreen Wetland (PFO4). Non-tidal freshwater wetlands dominated by needle-leaved woody vegetation having minimum of 20-foot height and 3 inches diameter with salinity levels are below 0.5.
- Palustrine Scrub-Shrub Broad-leaved Deciduous Wetland (PSS1). Non-tidal freshwater wetlands dominated by woody plants less than 20-foot height.

Wildlife. Includes game and non-game vertebrate animals typically including native mammals, birds, reptiles, and amphibians.

Woodland. A small area of land having a lower density of trees than forests and may contain plants lacking woody stems.

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14.0 APPENDICES

14.1 Standard Appendices

Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP.

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; Legacy Resource Management Program	Establishes the “Legacy Resource Management Program” for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, <i>Protection and Enhancement of Environmental Quality</i>	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, <i>Protection and Enhancement of the Cultural Environment</i>	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, <i>Exotic Organisms</i>	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, <i>Floodplain Management</i>	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, <i>Off-Road vehicles on Public Lands</i>	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, <i>Protection of Wetlands</i>	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

EO 12088, <i>Federal Compliance with Pollution Control Standards</i>	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (US EPA) authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 12898, <i>Environmental Justice</i>	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, <i>Invasive Species</i>	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, <i>Responsibilities of Federal Agencies to Protect Migratory Birds</i>	The USFWS has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 U.S.C. § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 U.S.C. § 7401– 7671q, July 14, 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund) (26 U.S.C. § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. Installation Restoration Program guides cleanups at DoD installations.

Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 U.S.C. § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the NOAA Fisheries (National Marine Fisheries Service) and the preparation of a biological evaluation or a biological assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 U.S.C. § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 U.S.C. § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 U.S.C. § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 U.S.C. §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation’s waters. Primary authority for the implementation and enforcement rests with the US EPA.
Fish and Wildlife Conservation Act (16 U.S.C. § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 U.S.C. § 661 et seq.)	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900 (16 U.S.C. § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 U.S.C. § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural outleasing program.
Migratory Bird Treaty Act 16 U.S.C. § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.

<p>National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 U.S.C. § 4321 et seq.</p>	<p>Requires federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act [40 Code of Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.</p>
<p>National Historic Preservation Act, 16 U.S.C. § 470 et seq.</p>	<p>Requires federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.</p>
<p>National Trails Systems Act (16 U.S.C. § 1241–1249)</p>	<p>Provides for the establishment of recreation and scenic trails.</p>
<p>National Wildlife Refuge Acts</p>	<p>Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.</p>
<p>National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee)</p>	<p>Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.</p>
<p>Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001–13; 104 Stat. 3042), as amended</p>	<p>Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.</p>
<p>Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)</p>	<p>Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a federal permit. Installations should coordinate with the U.S. Army Corps of Engineers (USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System (NPDES) and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.</p>
<p>Sale of certain interests in land, 10 U.S.C. § 2665</p>	<p>Authorizes sale of forest products and reimbursement of the costs of management of forest resources.</p>
<p>Soil and Water Conservation Act (16 U.S.C. § 2001, P.L. 95-193)</p>	<p>Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other federal and local programs.</p>

<p>Sikes Act (16 U.S.C. § 670a–670l, 74 Stat. 1052), as amended</p>	<p>Provides for the cooperation of DoD, the Departments of the Interior (USFWS), and the State Fish and Game Department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an INRMP and public access to natural resources and allows collection of nominal hunting and fishing fees.</p> <p>NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 U.S.C. § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, August 4, 1983 (Revised May 29, 2003) does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.</p>
<p>DoD Policy, Directives, and Instructions</p>	
<p>DoD Instruction 4150.07 <i>DoD Pest Management Program</i> dated 29 May 2008</p>	<p>Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.</p>
<p>DoD Instruction 4715.1, <i>Environmental Security</i></p>	<p>Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.</p>
<p>DoD Instruction (DoDI) 4715.03, <i>Natural Resources Conservation Program</i></p>	<p>Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.</p>
<p>OSD Policy Memorandum, 17 May 2005—<i>Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands</i></p>	<p>Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.</p>

<p>OSD Policy Memorandum, 1 November 2004— <i>Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews</i></p>	<p>Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.</p>
<p>OSD Policy Memorandum, 10 October 2002— <i>Implementation of Sikes Act Improvement Act: Updated Guidance</i></p>	<p>Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance <i>Implementation of the Sikes Act Improvement Amendments</i>. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.</p>
<p>USAF Instructions and Directives</p>	
<p>32 CFR Part 989, as amended, and AFI 32-7061, <i>Environmental Impact Analysis Process (EIAP)</i></p>	<p>Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.</p>
<p>AFI 32-1015, <i>Integrated Installation Planning</i></p>	<p>This publication establishes a comprehensive and integrated planning framework for development/redevelopment of Air Force installations..</p>
<p>AFMAN 32-7003, <i>Environmental Conservation</i></p>	<p>Implements AFPD 32-70, <i>Environmental Quality</i>; DoDI 4715.03, <i>Natural Resources Conservation Program</i>; and DoDI 7310.5, <i>Accounting for Sale of Forest Products</i>. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.</p>
<p>AFI 32-7065, <i>Cultural Resources Management</i></p>	<p>This Manual implements AFPD 32-70 and DoDI 4710.1, <i>Archaeological and Historic Resources Management</i>. It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.</p>
<p>AFI 32-10112 <i>Installation Geospatial Information and Services (IGI&S)</i></p>	<p>This instruction implements Department of Defense Instruction (DoDI) 8130.01, <i>Installation Geospatial Information and Services (IGI&S)</i> by identifying the requirements to implement and maintain an Air Force Installation Geospatial Information and Services program and Air Force Policy Directive (AFPD) 32-10 <i>Installations and Facilities</i>.</p>
<p>AFPD 32-70, <i>Environmental Quality</i></p>	<p>Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.</p>

<p>Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on January 29, 1999</p>	<p>Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.</p>
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14.1.1 Appendix B. Regulatory Coordination

14.1.2 Appendix C. State and Federal Concurrence & Consultation Letters

14.1.3 Appendix D. Public Notice of Availability

14.1.4 Appendix E. State Listed Species, dated October 24, 2017

Virginia Department of Wildlife Resources List of Special Status Faunal Species in Virginia*
<https://www.dgif.virginia.gov/wp-content/uploads/virginia-threatened-endangered-species.pdf>

Virginia Department of Wildlife Resources List of Native and Naturalized Fauna of Virginia*
<https://www.dgif.virginia.gov/wp-content/uploads/virginia-native-naturalized-species.pdf>

* This document is updated periodically by the Virginia Department of Wildlife Resources. Accessing the above link will provide the most current document.

14.1.5 Appendix F. Relevant Environmental Laws

1. Federal

1.1. Archaeological and Historic Data Preservation Act of 1974 (16 O.K. 469 *et seq.*). Directs Federal agencies to notify the Secretary of the Interior when any Federal construction project of a Federally licensed activity or program may cause irreparable loss or destruction of significant scientific, prehistoric, historic, or archaeological data.

1.2. Archaeological Resources Protection Act (ARPA) of 1979 (16 USC. 1982 *et seq.*). Prohibits the removal, sale, receipt, and interstate transportation of archaeological resources obtained illegally (without permits) from public or Native American lands and authorizes Agency permit procedures for investigations of archaeological resources on public lands under the Agency’s control.

1.3. Bald and Golden Eagle Protection Act (BEPA) of 1940, as amended (16 USC. 668 *et seq.*). Amended in 1972, prohibits the killing, harassment, possession, or selling of bald eagles. Also imposes penalties for the possession of bald eagles or eagle parts taken from birds after June 1940.

1.4. **Chesapeake Bay Preservation Act.** The Chesapeake Bay Preservation Act, commonly known as "The Bay Act" in Virginia, was adopted by the Virginia General Assembly in 1988. The Bay Act is designed to improve water quality in the Chesapeake Bay and its tributaries by requiring the use of effective conservation planning and pollution prevention practices when using and developing environmentally sensitive lands called Chesapeake Bay Preservation Areas.

1.5. **Clean Water Act (CWA) of 1977** (see Federal Water Pollution Control Act).

1.6. **Coastal Zone Management Act (CZMA) of 1972** (16 USC. 1451 *et seq.*). Provides incentives for coastal States to develop and implement coastal area management programs. Plays a significant role in water-pollution abatement, particularly with regard to nonpoint source pollution. State coastal zone management programs frequently incorporate flood control, sediment control, grading control, and stormwater runoff control statutes. Under the CZMA, Federal actions that have a direct impact on the coastal zone must be consistent to the maximum extent practicable with the State program.

1.7. **Conservation Programs on Military Reservations** (see **Sikes Act**).

1.8. **Endangered Species Act (ESA) of 1973** (16 USC. 1531 *et seq.*). Determines and protects both plant/animal species and their critical habitats that are threatened or endangered. Prohibits any Federal action that may jeopardize such species and provides for the designation of critical habitat of such species wherein no action is to be taken concerning degradation of the habitat. Requires a Biological Assessment of Federal agency actions when an endangered or threatened species may be present in the area affected by the actions.

1.9. **Federal Noxious Weed Act of 1974** (7 USC. 2801 *et seq.*). Provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce. Requires a general or specific permit from the Secretary of Agriculture for the movement of noxious weeds identified in the regulation into or through the United States unless such movement is from Canada.

1.10. **Federal Water Pollution Control Act (FWPCA) of 1972**, as amended (33 USC. 1251 *et seq.*). As the precursor to the CWA, contains virtually all the same tools and enforcement mechanisms that the CWA contains. The CWA amendments of the FWPCA in 1977 redefined the contaminants of concern, which had previously been oxygen-demanding materials. FWPCA is usually referred to as the CWA.

1.11. **Clean Water Act (CWA) of 1977**, as amended (Public Law 95–217, 33 USC. 1251 *et seq.*). The major Federal legislation concerning improvement of the Nation's water resources. A compilation of decades of Federal water pollution control legislation amended the Federal Water Pollution Control Act (FWPCA) and requires Federal agency consistency with State nonpoint source pollution-abatement plans. Amended in 1987 to strengthen enforcement mechanisms and to regulate stormwater runoff. Provides for the development of municipal and industrial wastewater treatment standards and a permitting system to control wastewater discharges to surface waters. Contains specific provisions for the regulation of dredge soil disposal within navigable waters and for the placement of material into wetlands. Permits are

required under sections 401, 402, and 404 for proposed actions that involve wastewater discharges and/or dredging/placement of fill in wetlands or navigable waters. These permits are required prior to the initiation of proposed actions.

1.12. **Fish and Wildlife Conservation Act of 1980** (16 USC. 2901 *et seq.*). Promotes State programs for the purpose of conserving, restoring, or otherwise benefiting nongame fish and wildlife and their habitat.

1.13. **Fish and Wildlife Coordination Act** (Public Law 85–624; 16 USC. 661 *et seq.*). Passed in 1934, assures that wildlife conservation receives equal consideration and be coordinated with other features of water resource development. Federal agencies (or other agencies with Federal permit) proposing to impound, divert, or control waters are required to consult with USFWS and the State wildlife agency. The Act authorized project modification, acquisition of land, and other measures necessary to protect wildlife.

1.14. **Migratory Bird Conservation Act** (16 USC. 715–715d, 715e, 715f–715r) of 18 Feb 29, (45 Stat. 1222). Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. Authorizes the Secretary of the Interior to cooperate with local authorities in wildlife conservation and to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges.

1.15. **Migratory Bird Treaty Act (MBTA) of 1918** as amended, (16 USC. 703 *et seq.*). Prohibits taking or harming a migratory bird, its eggs, nests, or young, without the appropriate permit.

1.16. **Military Construction Authorization Act** (Public Law 97–321, 10 USC. 2665 *et seq.*). Passed annually, an annual update of military construction projects. Provides for the production and sale of forest products and the outleasing of public lands, including outleasing for agricultural purposes. Installations containing forested lands or lands with the potential to grow and produce forest products must ensure the optimum sustainable yield of forest products and the improvement of forest resources, consistent with the military mission and local ecosystem condition.

1.17. **Military Reservation and Facilities: Hunting, Fishing and Trapping** (10 USC. 2671). Requires that hunting, fishing, and trapping will be in accordance with State laws.

1.18. **National Environmental Policy Act (NEPA) of 1969** (42 USC. 4321 *et seq.*). Ensures that environmental factors are given the same consideration as other factors in decision-making by Federal agencies. Through the environmental impact assessment process, NEPA mandates that all Federal agencies consider the environmental effects of, and any alternatives to, all proposals for Federal actions that may or will significantly affect the quality of the human environment. Also established the Council on Environmental Quality in the Executive Office of the President.

1.19. **National Historic Preservation Act (NHPA) of 1966** (16 USC. 470 *et seq.*). Provides for the nomination, identification (through listing on the National Register of Historic Places (NRHP)), and protection of historical and cultural properties of significance. The Act establishes specific procedures for compliance, including initial review authority by the cognizant State Historic Protection Officer.

1.20. **North American Wetlands Conservation Act** (16 USC. 4401). Encourages partnerships among Federal agencies and others to protect, restore, enhance, and manage wetlands and other habitats for migratory birds, fish, and wildlife.

1.21. **Noxious Plant Control Act of 1968** (43 USC. 1241 *et seq.*). Requires the head of Federal departments and agencies to allow a State having a program for the control of noxious plants to enter upon any Federal lands, for the purpose of controlling noxious plants, if certain criteria are met.

1.22. **Sikes Act Improvement Act (SAIA)** (see also **Conservation Programs on Military Reservations of 1960**), as amended (16 USC. 670(a) *et seq.*). Requires each military department to (1) manage natural resources and ensure that necessary services are provided for the management of fish-and-wildlife resources on each installation, (2) provide their personnel with professional training in fish-and-wildlife management, and (3) give priority to contracting work with Federal and State agencies responsible for the conservation or management of fish and wildlife. Authorizes cooperative agreements with State and local governments, non-Governmental organizations, and individuals who call for each party to provide matching funds or services to carry out natural resources projects and initiatives.

1.23. **Soil Conservation Act of 1938** (16 USC. 5901 *et seq.*). Provides for the application of soil conservation practices on Federal lands.

1.24. **Timber Sales on Military Lands** (10 USC. 2665). Allows the proceeds from the sale of recyclable material to be credited to the installation to cover specified costs. The President may sell any interest in land acquired for the production of lumber or timber products except land under control of the Army or Air Force and may also sell forest products produced on land owned or leased by a military department. The President must determine the prices for such sales and may use the proceeds to reimburse DoD appropriations for production costs. The States where military installations selling forestry products are located are entitled to compensation and may expend that compensation on for the benefit of public schools and public roads in the county where the military installation is located.

1.25. **Watershed Protection and Flood Prevention Act** (16 USC. 1001; 33 USC. 701). Authorizes Federal assistance to local organizations for planning and carrying out projects in watershed areas for conservation and use of land and water, and flood prevention.

2. Executive Orders (EOs)

2.1. **EO 11514 Protection and Enhancement of Environmental Quality** (5 Mar 70). Requires the Federal Government to provide leadership in protecting and enhancing the

quality of the Nation's environment to sustain and enrich human life. Federal agencies are to initiate measures needed to direct their policies, plans, and programs so as to meet National environmental goals. See

<https://www.denix.osd.mil/denix/Public/Legislation/EO/note1.html>.

2.2. EO 11593 Protection and Enhancement of the Cultural Environment (13 May 71).

Directs Federal agencies to take a leadership role in preserving, restoring, and maintaining the historic and cultural environment of the Nation. Federal agencies must locate, inventory, and nominate to the National Register all historic resources under their jurisdiction or control. Requires the Federal Government to provide leadership in preserving, restoring and maintaining the historic and cultural environment of the Nation. See

<https://www.denix.osd.mil/denix/Public/Legislation/EO/note37.html>.

2.3. EO 11988 Floodplain Management (24 May 77). Requires each Agency, including

military departments, to provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. See

<https://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/EO/note2.html>.

2.4. EO 11990 Protection of Wetlands (24 May 77). Supports the avoidance of long- and

short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Directs each Agency, including military departments, to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the Agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. See <https://www.denix.osd.mil/denix/Public/Legislation/EO/note9.html>.

2.5. EO 12372 Intergovernmental Review of Federal Programs (14 Jul 82). Allows

States, after consultation with local officials, to establish their own process for review and comment on proposed Federal financial assistance and direct Federal development; increases Federal responsiveness to State and local officials by requiring Federal agencies to accommodate State and local views or explain why those views will not be

accommodated. See <https://www.denix.osd.mil/denix/Public/Legislation/EO/note34.html>.

2.6. **EO 12962 Recreational Fisheries** (7 Jun 95). Directs each Federal agency to the extent permitted by law and *where practicable*, and in cooperation with States and tribes, improve the quantity, function, sustainable productivity, and distribution of US aquatic resources for increased recreational fishing opportunities.

2.7. **EO 13112 Invasive Species** (3 Feb 99). Establishes the National Invasive Species Council (see www.invasivespecies.gov). Directs that each Federal agency whose actions may affect the status of invasive species will, *to the extent practicable* and permitted by law (1) identify such actions; (2) subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them; and (3) not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species.

2.8. **EO 13186 Responsibilities of Federal Entities to Protect Migratory Birds** (10 Jan 01). Directs each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, by 10 Jan 03, a Memorandum of Understanding (MOU) with the USFWS that will promote the conservation of migratory bird populations.

2.9. **Presidential Memorandum on Environmentally Beneficial Landscaping** (26 Apr 94). The report of the National Performance Review contains recommendations for a series of environmental actions, including one to increase environmentally and economically beneficial landscaping practices at Federal facilities and Federally funded projects.

3. Department of Defense Documents.

- 3.1. **DOD Directive 4165.59** (29 Dec 75). DoD Implementation of the Coastal Zone Management Act.
- 3.2. **DOD Directive 4150.7** (22 Apr 96). DoD Pest Management Program.
- 3.3. **DOD Directive 4700.4** (24 Jan 89). Natural Resources Management Program.
- 3.4. **DOD Directive 4715.DD-R** (Apr 96). Draft Integrated Natural Resources Management in DoD.
- 3.5. **DOD Directive 4715.2** (3 May 96). DOD Regional Environmental Coordination.
- 3.6. **DOD Directive 4715.3** (3 May 96). Environmental Conservation Program.
- 3.7. **DOD Directive 6050.2** (19 Apr 79) (as amended). Use of Off-Road Vehicles on DOD Lands.
- 3.8. **DOD Instruction 6055.6** (10 Oct 00). DOD Fire and Emergency Services Program.
- 3.9. **DOD Instruction 4150.07** (29 May 08). DOD Pest Management Program
- 3.10. **DOD Instruction 4715.3** (3 May 96). Environmental Conservation Program.
- 3.11. **DOD Instruction 4715.9** (3 May 96). Environmental Planning and Analysis.

4. U.S. Air Force Regulations.

- 4.1 AFMAN 32-7003, Environmental Conservation (20 April 2020).
 4.2 AFMAN 32-1053, Integrated Pest Management Program (6 August 2019).

14.1.6 Appendix G. Flora Recorded on JBLE-Eustis

The following list of flora recorded on JBLE-Eustis is based on the Plant Survey and Herbarium Collection Final Report (Terwilliger Consulting, 2001), JBLE-Eustis Timber Inventory and Forest Management Plan (Terwilliger Consulting, 2007) and the USACE-Norfolk District wetland delineation. The Specimen No. and Symbol USDA fields refer to actual specimens collected as part of the Plant Survey and Herbarium Collection Final Report.

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>Acer rubrum</i>	213	Red Maple	Aceraceae	ACRU
<i>Achillea millefolium</i>	48	Yarrow	Asteraceae	ACMI2
<i>Agalinis purpurea</i>	163	Purple False Foxglove	Scrophulariaceae	AGPU5
<i>Alisma subcordatum</i>	73	American Water Plantain	Alismataceae	ALSU
<i>Allium vineale</i>	69	Field Garlic	Liliaceae	ALVI
<i>Alnus serrulata</i>	107	Common Alder	Betulaceae	ALSE2
<i>Amelanchier stolonifera</i>	3	Running Serviceberry	Rosaceae	AMST80
<i>Amphicarpa bracteata</i>	148	American Hogpeanut	Fabaceae	AMBR2
<i>Anagallis arvensis</i>	45	Scarlet Pimpernel	Primulaceae	ANAR
<i>Apios americana</i>	106	Groundnut	Fabaceae	APAM
<i>Aralia spinosa</i>	99	Devils Walking Stick	Araliaceae	ARSP2
<i>Arisaema triphyllum</i>	249	Jack in the Pulpit	Araceae	ARTR
<i>Asclepias incarnata</i>	93	Swamp Milkweed	Asclepiadaceae	ASIN
<i>Asclepias lanceolata</i>	63	Smooth Orange Milkweed	Asclepiadaceae	ASLA2
<i>Asclepias syriaca</i>	206	Common Milkweed	Asclepiadaceae	ASSY
<i>Asimina triloba</i>	224	Pawpaw	Annonaceae	ASTR
<i>Asparagus officinalis</i>	37	Garden Asparagus	Liliaceae	ASOF
<i>Asplenium platyneuron</i>	181	Ebony Spleenwort	Aspleniaceae	ASPL
<i>Aster pilosus</i>	161	Heath Aster	Asteraceae	ASPI2
<i>Athyrium filix-femina</i>	80	Common Ladyfern	Dryopteridaceae	ATFI

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>Baccharis halimifolia</i>	144	Groundsel Tree	Asteraceae	BAHA
<i>Bidens bipinnata</i>	209	Spanish Needles	Asteraceae	BIBI7
<i>Bidens frondosa</i>	180	Sticktight or Beggar Ticks	Asteraceae	BIFR
<i>Bidens polylepis</i>	162	Beggar Ticks	Asteraceae	BIPO
<i>Boehmeria cylindrica</i>	94	False Nettle	Urticaceae	BOCY
<i>Boltonia caroliniana</i>	139	Carolina Doll's Daisy	Asteraceae	BOCA2
<i>Botrychium dissectum var obliquum</i>	154	Common Grape Fern	Ophioglossaceae	BODIO
<i>Cackile edentula</i>	147	American Searocket	Brassicaceae	CAED
<i>Callicarpa americana</i>	112	French Mulberry	Verbenaceae	CAAM2
<i>Campsis radicans</i>	221	Trumpet Creeper	Bignoniaceae	CARA2
<i>Carex folliculata</i>	67	Northern Long Sedge	Cyperaceae	CAFO6
<i>Carex longii</i>	214	Long's Sedge	Cyperaceae	CALO5
<i>Carex lupulina</i>	255	Hop Sedge	Cyperaceae	CALU4
<i>Carex lurida</i>	117	Shallow Sedge	Cyperaceae	CALU5
<i>Carya cordiformis</i>	166	Bitternut Hickory	Juglandaceae	CACO15
<i>Carya tomentosa</i>	182	Mockernut Hickory	Juglandaceae	CATO6
<i>Cassia nictitans</i>	200	Partridge Pea	Fabaceae	CANI4
<i>Celtis laevigata</i>	137	Sugarberry	Ulmaceae	CELA
<i>Celtis occidentalis</i>	167	Hackberry	Ulmaceae	CEOC
<i>Cephalanthus occidentalis</i>	232	Buttonbush	Rubiaceae	CEOC2
<i>Chaerophyllum tainturieri</i>	12	Wild Chervil	Apiaceae	CHTA
<i>Chenopodium ambrosioides</i>	116	Mexican Tea	Chenopodiaceae	CHAM
<i>Clematis dioscoreifolia</i>	129	Clematis	Ranunculaceae	CLDI7
<i>Clitoria mariana</i>	54	Butterfly Pea	Fabaceae	CLMA4
<i>Conyza canadensis var pusilla</i>	179	Canadian Horseweed	Asteraceae	COCAP3
<i>Cornus florida</i>	4	Flowering Dogwood	Cornaceae	COFL2
<i>Cryptotaenia canadensis</i>	86	Canadian Honewort	Apiaceae	CRCA9
<i>Cuscuta indecora</i>	127	Common Dodder	Cuscutaceae	CUIN
<i>Cuscuta pentagona</i>	142	Five Angled Dodder	Cuscutaceae	CUPEP2
<i>Cynodon dactylon</i>	197	Bermudagrass	Poaceae	CYDA
<i>Cynoglossum</i>	228	Wild Comprey	Boraginaceae	CYVI

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>virginianum</i>				
<i>Cyperus pseudovegetus</i>	177	Marsh Flatsedge	Cyperaceae	CYPS
<i>Cyperus strigosus</i>	158	Strawcolored Flatsedge	Cyperaceae	CYST
<i>Cytisus scoparius</i>	33	Scotch Broom	Fabaceae	CYSC4
<i>Daucus carota</i>	111	Queen Annes Lace	Apiaceae	DACA6
<i>Decodon verticillatus</i>	95	Swamp Loosestrife	Lythraceae	DEVE
<i>Desmanthus illinoensis</i>	75	Prairie Bundleflower	Fabaceae	DEIL
<i>Digitaria sanguinalis</i>	149	Flat Top Goldentop	Poaceae	DISA
<i>Diodia teres</i>	152	Poor Joe	Rubiaceae	DITE2
<i>Diospyros virginiana</i>	118	Persimmon	Ebenaceae	DIVI5
<i>Draba verna</i>	223	Spring Draba	Brassicaceae	DRVE2
<i>Duchesnea indica</i>	21	Indian Strawberry	Rosaceae	DUIN
<i>Echinochloa crus-galli</i>	169	Barnyard Grass	Poaceae	ECCR
<i>Eclipta alba</i>	130	False Daisy	Asteraceae	ECAL
<i>Elaeagnus umbellata</i>	122	Autumn Olive	Elaeagnaceae	ELUM
<i>Eleocharis obtusa</i>	91	Blunt Spikerush	Cyperaceae	ELOB2
<i>Elephantopus carolinianus</i>	202	Devil's Grandmother	Asteraceae	ELCA3
<i>Elephantopus tomentosus</i>	101	Devil's Grandmother or Elephant's-foot	Asteraceae	ELTO2
<i>Elymus virginicus</i>	76	Virginia Wildrye	Poaceae	ELVI3
<i>Epifagus virginiana</i>	159	Beech Drops	Orobanchaceae	EPVI2
<i>Eragrostis pilosa</i>	176	Indian Lovegrass	Poaceae	ERPI2
<i>Erigeron philadelphicus</i>	160	Philadelphia Fleabane	Asteraceae	ERPH
<i>Erigeron pulchellus</i>	61	Robin's Plaintain	Asteraceae	ERPU
<i>Erigeron quercifolius</i>	195	Overleaf Fleabane	Asteraceae	ERQU
<i>Erigeron strigosus</i>	109	Lesser Daisy Fleabane	Asteraceae	ERST3
<i>Erigeron vernus</i>	88	Early Whitetop Fleabane	Asteraceae	ERVE
<i>Eupatorium coelestinum</i>	85	Mist Flower	Asteraceae	EUCO6
<i>Eupatorium hyssopifolium</i>	135	Hyssop-leaved Throughwort	Asteraceae	EUHY
<i>Eupatorium rotundifolium</i>	90	Round Leaved Boneset	Asteraceae	EURO4

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>Eupatorium rugosum</i>	134	White Snakeroot	Asteraceae	EURU6
<i>Euphorbia chamaesyce</i>	131		Euphorbiaceae	EUCH7
<i>Euthamia graminifolia</i>	150	Flat-top Goldentop	Asteraceae	EUGR5
<i>Fagus grandifolia</i>	216	American Beech	Fagaceae	FAGR
<i>Galium circaezans</i>	113	Licorice Bedstraw	Rubiaceae	GACI2
<i>Galium tinctorium</i>	193	Stiff Marsh Bedstraw	Rubiaceae	GATI
<i>Geranium dissectum</i>	13	Cranesbill	Geraniaceae	GEDI
<i>Geum canadense</i>	71	White Avens	Rosaceae	GECA7
<i>Geum virginianum</i>	77	Cream Avens	Rosaceae	GEVI4
<i>Glecoma hederacea</i>	23	Ground Ivy	Lamiaceae	GLHE2
<i>Gnaphalium purpureum</i>	26	Cudweed	Asteraceae	GNPU2
<i>Gratiola neglecta</i>	217	Clammy Hedgehyssop	Scrophulariaceae	GRNE
<i>Hedera helix</i>	184	English Ivy	Araliaceae	HEHE
<i>Hexastylis virginica</i>	18	Heartleaf Wild Ginger	Aristolochiaceae	HEVI3
<i>Hibiscus moscheutos</i>	205	Crimson-eyed Rosemallow	Malvaceae	HIMO
<i>Houstonia caerulea</i>	244	Azure Bluet	Rubiaceae	HOCA4
<i>Houstonia pusilla</i>	238	Tiny Bluet	Rubiaceae	HOPU3
<i>Hydrocotyle umbellata</i>	211	Marsh Pennywort	Apiaceae	HYUM
<i>Hypericum gentianoides</i>	140	Orangegrass	Clusiaceae	HYGE
<i>Hypericum mutilum</i>	192	Dwarf St. Johnswort	Clusiaceae	HYMU
<i>Hypericum punctatum</i>	82	Spotted St. Johnswort	Clusiaceae	HYPV
<i>Hypochoeris radicata</i>	27	Cats Ear	Asteraceae	HYRA3
<i>Hypoxis hirsuta</i>	123	Star Grass	Iridaceae	HYHI2
<i>Ilex opaca</i>	42	American Holly	Aquifoliaceae	ILOP
<i>Ipomoea purpurea</i>	38	Common Morning Glory	Convolvulaceae	IPPU2
<i>Iva frutescens</i>	207	Jesuit's Bark	Asteraceae	IVFR
<i>Juglans nigra</i>	128	Black Walnut	Juglandaceae	JUNI
<i>Juncus diffusissimus</i>	191	Slimpod Rush	Juncaceae	JUDI2
<i>Juncus effusus</i>	68	Common Rush	Juncaceae	JUEF
<i>Juncus marginatus</i>	173	Grassleaf Rush	Juncaceae	JUMA4

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>Juncus roemerianus</i>	259	Needlegrass Rush or Blackneedle Rush	Juncaceae	JURO
<i>Juniperus virginiana</i>	257	Eastern Redcedar	Cupressaceae	JUVI
<i>Krigia virginica</i>	31	Dwarf Dandelion	Asteraceae	KRVI
<i>Lamium amplexicaule</i>	22	Henbit Deadnettle	Lamiaceae	LAAM
<i>Lechea racemulosa</i>	199	Illinois Pinweed	Cistaceae	LERA
<i>Lespedeza bicolor</i>	121	Schrubby Lespedeza	Fabaceae	LEBI2
<i>Lespedeza cuneata</i>	84	Chinese Lespedeza	Fabaceae	LECU
<i>Lespedeza procumbens</i>	59	Trailing Lespedeza	Fabaceae	LEPR
<i>Lespedeza repens</i>	208	Creeping Lespedeza	Fabaceae	LERE2
<i>Lespedeza violacea</i>	203	Violet Lespedeza	Fabaceae	LEVI6
<i>Leucanthemum lacustre</i>	51	Portuguese Daisy	Asteraceae	LELA10
<i>Ligustrum sinense</i>	46	Chinese Privet	Oleaceae	LISI
<i>Lindernia dubia</i>	194	False Pimpernel	Scrophulariaceae	LIDU
<i>Liquidambar styraciflua</i>	30	Sweetgum	Hamamelidaceae	LIST2
<i>Liriodendron tulipifera</i>	215	Tuliptree	Magnoliaceae	LITU
<i>Listera australis</i>	220	Southern Twayblade	Orchidaceae	LIAU3
<i>Lobelia cardinalis</i>	78	Cardinal flower	Campanulaceae	LOCA2
<i>Lobelia inflata</i>	89	Indian Tobacco	Campanulaceae	LOIN
<i>Lobelia puberula</i>	133	Downy Lobelia	Campanulaceae	LOPU
<i>Ludwigia leptocarpa</i>	171	Seedbox	Onagraceae	LULE4
<i>Luzula acuminata</i>	236	Hairy Woodrush	Juncaceae	LUAC
<i>Luzula bulbosa</i>	235	Bulbous Woodrush	Juncaceae	LUBU
<i>Lycopodium obscurum</i>	155	Ground Pine	Lycopodiaceae	LYOB
<i>Lythrum lineare</i>	198	Wand Lythrum	Lythraceae	LYLI2
<i>Malus angustifolia</i>	53	Crabapple	Rosaceae	MAAN3
<i>Matelea gonocarpa</i>	96	Milkvine	Asclepiadaceae	MAGO
<i>Mazus japonicus</i>	20	Japanese Mazus	Scrophulariaceae	MAJA
<i>Mecardonia acuminata</i>	136	Axilflower	Scrophulariaceae	MEAC
<i>Melilotus alba</i>	70	White Sweetclover	Fabaceae	MEAL12
<i>Melothria pendula</i>	245	Creeping Cucumber	Curcubitaceae	MEPE3
<i>Microstegium vimineum</i>	178	Nepalese Browntop	Poaceae	MIVI
<i>Monotropa uniflora</i>	7	Indian Pipe	Monotropaceae	MOUN3

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>Muscari racemosum</i>	9	Grape hyacinth	Liliaceae	MURA2
<i>Myosotis arvensis</i>	229	Field Forget-me-not	Boraginaceae	MYAR
<i>Myrica cerifera</i>	119	Wax Myrtle	Myricaceae	MYCE
<i>Nothoscordum bivalve</i>	16	False Garlic	Liliaceae	NOBI2
<i>Nuttallanthus canadensis</i>	239	Canada Toadflax	Scrophulariaceae	NUCA
<i>Oenothera biennis</i>	204	Common Evening-primrose	Onagraceae	OEBI
<i>Onoclea sensibilis</i>	28	Sensitive Fern	Dryopteridaceae	ONSE
<i>Osmunda regalis L. var spectabilis</i>	102	Royal Fern	Osmundaceae	OSRES
<i>Oxalis dillenii</i>	25	Wood Sorrel	Oxalidaceae	OXDI2
<i>Oxalis stricta</i>	190	Common Yellow Oxalis	Oxalidaceae	OXST
<i>Oxalis violacea</i>	52	Violet Wood Sorrell	Oxalidaceae	OXVI
<i>Oxydendrum arboreum</i>	185	Sourwood	Ericaceae	OXAR
<i>Panicum amarum</i>	253	Bitter Panicgrass	Poaceae	PAAM2
<i>Panicum anceps</i>	196	Beaked Panicgrass	Poaceae	PAAN
<i>Paspalum dilatatum</i>	97	Dallisgrass	Poaceae	PADI3
<i>Passiflora incarnata</i>	120	Passion Flower	Passifloraceae	PAIN6
<i>Photinia pyrifolia</i>	17	Red Chokeberry	Rosaceae	PHPY4
<i>Phragmites australis</i>	256	Common Reed	Poaceae	PHAU7
<i>Phytolacca americana</i>	104	American Pokeweed	Phytolaccaceae	PHAM4
<i>Pinus taeda</i>	212	Loblolly Pine	Pinaceae	PITA
<i>Pinus virginiana</i>	210	Scrub Pine	Pinaceae	PIVI2
<i>Plantago lanceolata</i>	56	Narrowleaf Plantain	Plantaginaceae	PLLA
<i>Plantago major</i>	132	Common Plantain	Plantaginaceae	PLMA2
<i>Pluchea purpurascens</i>	126	Marsh Fleabane or Sweetscent	Asteraceae	PLPU2
<i>Polygonum arifolium</i>	174	Halbred-leaved Tearthumb	Polygonaceae	POAR6
<i>Polygonum cespitosum</i>	175	Smartweed or Oriental Ladysthumb	Polygonaceae	POCE4
<i>Polygonum persicaria</i>	103	Smartweed or Spotted Ladysthumb	Polygonaceae	POPE3
<i>Polygonum punctatum</i>	188	Dotted Smartweed	Polygonaceae	POPU5
<i>Polygonum</i>	172	Arrowleaf Tearthumb	Polygonaceae	POSA5

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>sagittatum</i>				
<i>Polystichum acrostichoides</i>	44	Christmas Fern	Dryopteridaceae	POAC4
<i>Pontederia cordata</i>	92	Pickerelweed	Pontederiaceae	POCO14
<i>Populus alba</i>	108	White Poplar	Salicaceae	POAL7
<i>Potentilla canadensis</i>	246	Dwarf Cinquefoil	Rosaceae	POCA17
<i>Prunus serotina</i>	10	Black Cherry	Rosaceae	PRSE2
<i>Pteridium aquilinum</i>	156	Bracken Fern	Dennstaedtiaceae	PTAQC
<i>Ptilimnium capillaceum</i>	74	Herb William	Apiaceae	PTCA
<i>Pueraria lobata</i>	260	Kudzu	Fabaceae	PULO
<i>Quercus alba</i>	164	White Oak	Fagaceae	QUAL
<i>Quercus ilicifolia</i>	187	Bear Oak	Fagaceae	QUIL
<i>Quercus michauxii</i>	186	Swamp Chestnut Oak	Fagaceae	QUMI
<i>Quercus velutina</i>	165	Black Oak	Fagaceae	QUVE
<i>Ranunculus abortivus</i>	234	Littleleaf Buttercup	Ranunculaceae	RAAB
<i>Ranunculus bulbosus</i>	6	Bulbous Buttercup	Ranunculaceae	RABU
<i>Ranunculus parviflorus</i>	247	Smallflower Buttercup	Ranunculaceae	RAPA3
<i>Ranunculus sardous</i>	58	Hairy Buttercup	Ranunculaceae	RASA
<i>Rhexia mariana</i>	55	Maryland Meadowbeauty	Melastomataceae	RHMA
<i>Rhus copallina</i>	138	Winged Sumac	Anacardiaceae	RHCOL
<i>Rhus radicans</i>	81	Poison Ivy	Anacardiaceae	RHRA6
<i>Rhynchospora corniculata</i>	189	Shortbristle Horned Beaksedge	Cyperaceae	RHCO2
<i>Robinia pseudoacacia</i>	5	Black Locust	Fabaceae	ROPS
<i>Rosa multiflora</i>	40	Multiflora Rose	Rosaceae	ROMU
<i>Rosa palustris</i>	66	Swamp Rose	Rosaceae	ROPA
<i>Rubus allegheniensis</i>	251	Allegheny Blackberry	Rosaceae	RUAL
<i>Rumex conglomeratus</i>	62	Dock	Polygonaceae	RUCO2
<i>Rumex crispus</i>	39	Curly Dock	Polygonaceae	RUCR
<i>Sabatia angularis</i>	250	Rosepink	Gentianaceae	SAAN
<i>Sabatia stellaris</i>	145	Rose of Plymouth	Gentianaceae	SAST5
<i>Salix nigra</i>	240	Black Willow	Salicaceae	SANI
<i>Sambucus nigra</i>	49	Elderberry	Caprifoliaceae	SANIC4

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>var. canadensis</i>				
<i>Sassafras albidum</i>	222	Sassafras	Lauraceae	SAAL5
<i>Saururus cernuus</i>	8	Lizards Tail	Saururaceae	SACE
<i>Schoenoplectus americanus</i>	115	Chairmakers Bulrush	Cyperaceae	SCAM6
<i>Schoenoplectus pungens</i>	233	Common Three Square	Cyperaceae	SCPUP5
<i>Scirpus atrovirens</i>	98	Green Bulrush	Cyperaceae	SCAT2
<i>Scirpus cyperinus</i>	124	Stalked Bulrush or Woolgrass	Cyperaceae	SCCY
<i>Scleranthus annuus</i>	230	German Knotgrass	Caryophyllaceae	SCAN2
<i>Scutellaria integrifolia</i>	60	Hyssop Skullcap	Lamiaceae	SCIN2
<i>Senecio aureus</i>	231	Golden Ragwort	Asteraceae	SEAU2
<i>Sesuvium maritimum</i>	143	Slender Seapurslane	Aizoaceae	SEMA3
<i>Setaria glauca</i>	168	Pearl Millet	Poaceae	SEGL8
<i>Sherardia arvensis</i>	14	Blue Fieldmadder	Rubiaceae	SHAR2
<i>Silene latifolia</i>	79	Bladder Champion	Caryophyllaceae	SILA21
<i>Sisyrinchium mucronatum</i>	43	Common Blue-eyed Grass	Iridaceae	SIMU3
<i>Smilax bona-nox</i>	34	Catbrier	Smilacaceae	SMBO2
<i>Solanum carolinense</i>	87	Carolina Horsenettle	Solanaceae	SOCA3
<i>Solidago pinetorum</i>	100	Small's Goldenrod	Asteraceae	SOPI
<i>Solidago speciosa var. erecta</i>	227	Showy Goldenrod	Asteraceae	SOSPE
<i>Sonchus asper</i>	32	Spiny Sowthistle	Asteraceae	SOAS
<i>Sorghum halepense</i>	183	Johnsongrass	Poaceae	SOHA
<i>Spartina alterniflora</i>	258	Smooth Cordgrass	Poaceae	SPAL
<i>Spartina cynosuroides</i>	226	Big Cordgrass	Poaceae	SPCY
<i>Spartina patens</i>	151	Saltmeadow Cordgrass	Poaceae	SPPA
<i>Strophostyles helvula</i>	146	Trailing Fuzzybean	Fabaceae	STHE4
<i>Taraxacum officinale</i>	254	Dandelion	Asteraceae	TAOF
<i>Teucrium canadense</i>	57	American germander	Lamiaceae	TECA3
<i>Thelypteris hexagonoptera</i>	157	Broad Beech Fern	Thelypteridaceae	THHE
<i>Tipularia discolor</i>	105	Crippled Crane-fly	Orchidaceae	TIDI
<i>Trichostema</i>	125	Blue Curls	Lamiaceae	TRDI2

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>dichotomum</i>				
<i>Trifolium arvense</i>	110	Rabbitfoot Clover	Fabaceae	TRAR4
<i>Trifolium campestre</i>	248	Low Hop Clover	Fabaceae	TRCA5
<i>Trifolium incarnatum</i>	35	Crimson Clover	Fabaceae	TRIN3
<i>Trifolium pratense</i>	83	Red Clover	Fabaceae	TRPR2
<i>Triodanis perfoliata</i>	219	Clasping Venus' Looking-glass	Campanulaceae	TRPE4
<i>Tripsacum dactyloides</i>	201	Eastern Gamagrass	Poaceae	TRDA3
<i>Typha angustifolia</i>	65	Narrowleaf Cattail	Typhaceae	TYAN
<i>Typha latifolia</i>	64	Cattail	Typhaceae	TYLA
<i>Ulmus americana</i>	218	American Elm	Ulmaceae	ULAM
<i>Vaccinium arboreum</i>	2	Farkleberry	Ericaceae	VAAR
<i>Vaccinium tenellum</i>	1	Small Black Blueberry	Ericaceae	VATE3
<i>Valerianella locusta</i>	15	Lewiston Cornsalad	Valerianaceae	VALO
<i>Valerianella radiata</i>	24	Beaked Cornsalad	Valerianaceae	VARA
<i>Verbascum blattaria</i>	50	Moth Mullein	Scrophulariaceae	VEBL
<i>Verbascum thapsus</i>	29	Common Mullein	Scrophulariaceae	VETH
<i>Verbena bonariensis</i>	41	Purpletop Vervain	Verbenaceae	VEBO
<i>Verbesina occidentalis</i>	72	Yellow Crownbeard	Asteraceae	VEOC
<i>Verbesina virginica</i>	141	White Crownbeard	Asteraceae	VEVI3
<i>Veronica peregrina</i>	225	Neckweed	Scrophulariaceae	VEPE2
<i>Veronica serpyllifolia</i>	19	Thymeleaf Speedwell	Scrophulariaceae	VESE
<i>Vicia angustifolia</i>	243	Garden Vetch	Fabaceae	VIAN
<i>Vicia hirsuta</i>	47	Tiny Vetch	Fabaceae	VIHI
<i>Vicia sativa</i>	11	Garden Vetch	Fabaceae	VISA
<i>Viola affinis</i>	241	Sand Violet	Violaceae	VIAF2
<i>Viola bicolor</i>	237	Field Pansy	Violaceae	VIBI
<i>Viola papilionacea</i>	242	Common Blue Violet	Violaceae	VIPA5
<i>Viola septemloba</i>	252	Southern Coastal Violet	Violaceae	VISE4
<i>Vitis vulpina</i>	114	Frost Grape	Vitaceae	VIVU
<i>Wisteria frutescens</i>	36	Wisteria	Fabaceae	WIFR
<i>Woodwardia areolata</i>	170	Netted Chainfern	Blechnaceae	WOAR

Table 14-1. Flora Recorded at JBLE-Eustis

Scientific Name	Specimen No.	Common Name	Family	Symbol USDA
<i>Xanthium strumarium</i>	153	Rough Cocklebur	Asteraceae	XAST

14.1.7 Appendix H. Mammals Observed on JBLE-Eustis

Table 14-2. Mammals Recorded on JBLE-Eustis

Scientific Name	Common Name
Marsupials	
<i>Didelphis virginianus virginianus</i>	Virginia opossum
Insectivores	
<i>Blarina carolinensis carolinensis</i>	Short-tailed shrew
<i>Cryptotis parva</i>	Least shrew
<i>Myotis lucifugus</i>	Little brown bat
<i>Perymyotis subflavus</i>	Tricolored bat
<i>Myotis septentrionalis</i>	Northern long-eared bat
<i>Eptesicus fuscus</i>	Big brown bat
<i>Lasiurus borealis</i>	Eastern red bat
<i>Lasiurus cinereus</i>	Hoary bat
<i>Lasiurus intermedius</i>	Northern yellow bat
<i>Lasionycteris noctivigans</i>	Silver-haired bat
<i>Lasiurus seminolus</i>	Seminole bat
<i>Myotis austroriparius</i>	Southeastern myotis
<i>Nycticeius humeralis</i>	Evening bat
<i>Scalopus aquaticus</i>	Eastern mole
<i>Sorex longirostris longirostris</i>	Southeastern shrew
<i>Tadarida brasiliensis</i>	Mexican free-tailed bat
Rodents	
<i>Castor canadensis</i>	Beaver
<i>Glaucomys volans</i>	Southern flying squirrel
<i>Marmota monax</i>	Groundhog
<i>Microtus pennsylvanicus</i>	Meadow vole
<i>Microtus pinetorum</i>	Woodland vole
<i>Mus musculus</i>	House mouse
<i>Ondatra zibethica macrodon</i>	Muskrat
<i>Oryzomys palustris palustris</i>	Marsh rice rat
<i>Peromyscus gossypinus</i>	Cotton mouse
<i>Peromyscus leucopus</i>	White-footed mouse
<i>Peromyscus nuttalli</i>	Golden mouse
<i>Sciurus carolinensis</i>	Eastern gray squirrel
<i>Sigmodon hispidus</i>	Hispid Cotton rat
Lagomorphs	

Table 14-2. Mammals Recorded on JBLE-Eustis

Scientific Name	Common Name
<i>Sylvilagus floridana mallurus</i>	Eastern cottontail rabbit
Carnivores	
<i>Canis lutrans</i>	Coyote
<i>Lontra canadensis lataxina</i>	Northern River Otter
<i>Lynx rufus</i>	Red fox
<i>Neogale vison</i>	American mink
<i>Procyon lotor</i>	Northern Raccoon
<i>Urocyon cinereoargenteus</i>	Gray fox
<i>Ursus americanus</i>	American black bear
<i>Vulpes vulpes fulva</i>	Red fox
Ungulates	
<i>Odocoileus virginiana</i>	White-tailed deer

14.1.8 Appendix I. Birds Observed on JBLE-Eustis

Table 14-3. Birds Observed on JBLE-Eustis

Scientific Name	Common Name
Order Anseriforms	
<i>Aix sponsa</i>	Wood duck
<i>Anas acuta</i>	Northern pintail
<i>Anas crecca</i>	Green-winged teal
<i>Anas platyrhynchos</i>	Mallard
<i>Anas rubripes</i>	American black duck
<i>Aythya affinis</i>	Lesser scaup
<i>Aythya americana</i>	Redhead
<i>Aythya collaris</i>	Ring-necked duck
<i>Aythya marila</i>	Greater scaup
<i>Aythya valisineria</i>	Canvasback
<i>Branta canadensis</i>	Canada goose
<i>Bucephala albeola</i>	Bufflehead
<i>Bucephala clangula</i>	Common goldeneye
<i>Clangula hyemalis</i>	Long-tailed duck
<i>Cygnus columbianus</i>	Tundra swan
<i>Cygnus olor</i>	Mute swan
<i>Lophodytes cucullatus</i>	Hooded merganser
<i>Mareca americanum</i>	American widgeon
<i>Mareca strepera</i>	Gadwall
<i>Mergus merganser</i>	Common merganser
<i>Mergus serrator</i>	Red-breasted merganser
<i>Oxyura jamaicensis</i>	Ruddy duck

Table 14-3. Birds Observed on JBLE-Eustis

Scientific Name	Common Name
<i>Spatula clypeata</i>	Northern shoveler
<i>Spatula discors</i>	Blue-winged teal
Order Pelecaniformes	
<i>Ardea alba</i>	Great egret
<i>Ardea herodias</i>	Great blue heron
<i>Botaurus lentiginosus</i>	American bittern
<i>Bubulcus ibis</i>	Cattle egret
<i>Butorides virescens</i>	Green heron
<i>Egretta thula</i>	Snowy egret
<i>Gavia immer</i>	Common loon
<i>Ixobrychus exilis</i>	Least bittern
<i>Nycticorax violaceus</i>	Yellow-crowned night-heron
<i>Pelecanus occidentalis</i>	Brown pelican
<i>Phalacrocorax auritus</i>	Double-crested cormorant
<i>Podiceps auritus</i>	Horned Red-necked grebe
<i>Podiceps grisegena</i>	Red-necked grebe
<i>Podilymbus podiceps</i>	Pied-billed grebe
Order Charadriiformes	
<i>Actitis macularia</i>	Spotted sandpiper
<i>Arenaria interpres</i>	Ruddy turnstone
<i>Calidris alba</i>	Sanderling
<i>Calidris alpina</i>	Dunlin
<i>Calidris fuscicollis</i>	White-rumped sandpiper
<i>Calidris himantopus</i>	Stilt sandpiper
<i>Calidris mauri</i>	Western sandpiper
<i>Calidris melanotos</i>	Pectoral sandpiper
<i>Calidris minutilla</i>	Least sandpiper
<i>Calidris pusilla</i>	Semipalmated sandpiper
<i>Charadrius semipalmatus</i>	Semipalmated plover
<i>Charadrius vociferous</i>	Killdeer
<i>Chlidonias niger</i>	Black tern
<i>Chroichonyx philadelphia</i>	Bonaparte's gull
<i>Gallinago gallinago</i>	Common snipe
<i>Hydroprogne caspia</i>	Caspian tern
<i>Larus delawarensis</i>	Ring-billed gull
<i>Larus fuscus</i>	Lesser black-backed gull
<i>Larus marinus</i>	Great black-backed gull
<i>Leucophaeus atricilla</i>	Laughing gull
<i>Limnodromus griseus</i>	Short-billed dowitcher
<i>Limnodromus scolopaceus</i>	Long-billed dowitcher

Table 14-3. Birds Observed on JBLE-Eustis

Scientific Name	Common Name
<i>Phalaropus tricolor</i>	Wilson's phalarope
<i>Porzana carolina</i>	Sora rail
<i>Rallus crepitans</i>	Clapper rail
<i>Rallus limicola</i>	Virginia rail
<i>Scolopax minor</i>	American woodcock
<i>Sterna forsteri</i>	Forster's tern
<i>Sterna hirundo</i>	Common tern
<i>Thalasseus maximus</i>	Royal tern
<i>Tringa flavipes</i>	Lesser yellowlegs
<i>Tringa melanoleuca</i>	Greater yellowlegs
<i>Tringa solitaria</i>	Solitary sandpiper
Order Coraciiformes	
<i>Megaceryle alcyon</i>	Belted kingfisher
Order Falconiformes	
<i>Falco columbarius</i>	Merlin
<i>Falco sparverius</i>	American kestrel
Order Accipitriformes	
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Accipiter striatus</i>	Sharp-shinned hawk
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Buteo lineatus</i>	Red-shouldered hawk
<i>Cathartes aura</i>	Turkey vulture
<i>Coragyps atratus</i>	Black vulture
<i>Circus hudsonius</i>	Northern harrier
<i>Haliaeetus leucocephalus</i>	Bald eagle
<i>Pandion haliaetus</i>	Osprey
Order Galliformes	
<i>Colinus virginianus</i>	Northern bobwhite
<i>Gallinula chloropus</i>	Common moorhen
<i>Meleagris gallopavo</i>	Wild turkey
Order Apodiformes	
<i>Archilochus colubris</i>	Ruby-throated hummingbird
<i>Chaetura pelagica</i>	Chimney swift
Order Passeriformes	
<i>Agelaius phoeniceus</i>	Red-winged blackbird
<i>Ammodramus leconteii</i>	LeConte's sparrow
<i>Baeolophus bicolor</i>	Tufted titmouse
<i>Bombycilla cesrorum</i>	Cedar waxwing
<i>Cardellina pusilla</i>	Wilson's warbler
<i>Cardinalis cardinalis</i>	Northern cardinal

Table 14-3. Birds Observed on JBLE-Eustis

Scientific Name	Common Name
<i>Catharus fuscescens</i>	Veery
<i>Catharus guttatus</i>	Hermit thrush
<i>Certhia americana</i>	Brown creeper
<i>Cistothorus palustris</i>	Marsh wren
<i>Cistothorus platenis</i>	Sedge wren
<i>Coccyzus americanus</i>	Yellow-billed cuckoo
<i>Corvus bachyrrhynchus</i>	American crow
<i>Corvus ossifragus</i>	Fish crow
<i>Cyanocitta cristata</i>	Blue jay
<i>Dumetella carolinensis</i>	Gray catbird
<i>Euphagus carolinus</i>	Rusty blackbird
<i>Geothlypis trichas</i>	Common yellowthroat
<i>Haemorhous mexicanus</i>	House finch
<i>Haemorhous purpureus</i>	Purple finch
<i>Hirundo rustica</i>	Barn swallow
<i>Icteria virens</i>	Yellow-breasted chat
<i>Icterus galbula</i>	Baltimore oriole
<i>Icterus spurius</i>	Orchard oriole
<i>Junco hyemalis</i>	Dark-eyed junco
<i>Leiothlypis celata</i>	Orange-crowned warbler
<i>Melospiza georgiana</i>	Swamp sparrow
<i>Melospiza melodia</i>	Song sparrow
<i>Molothrus ater</i>	Brown-headed cowbird
<i>Mniotilta varia</i>	Black-and-white warbler
<i>Myiarchus crinitus</i>	Great crested flycatcher
<i>Quiscalus quiscula</i>	Common grackle
<i>Parkesia noveboracensis</i>	Northern waterthrush
<i>Passer domesticus</i>	House sparrow
<i>Passerculus sandwichensis</i>	Savannah sparrow
<i>Passerella iliaca</i>	Fox sparrow
<i>Passerina caerulea</i>	Blue grosbeak
<i>Passerina cyanea</i>	Indigo bunting
<i>Pheucticus ludovicianus</i>	Rose-breasted grosbeak
<i>Pipilo erythrophthalmus</i>	Eastern towhee
<i>Piranga olivacea</i>	Scarlet tanager
<i>Piranga rubra</i>	Summer tanager
<i>Poecile carolinensis</i>	Carolina chickadee
<i>Polioptila caerulea</i>	Blue-gray gnatcatcher
<i>Pooecetes gramineus</i>	Vesper sparrow
<i>Progne subis</i>	Purple martin

Table 14-3. Birds Observed on JBLE-Eustis

Scientific Name	Common Name
<i>Protonotaria citrea</i>	Prothonotary warbler
<i>Regulus calendula</i>	Ruby-crowned kinglet
<i>Riparia riparia</i>	Bank swallow
<i>Sayornis phoebe</i>	Eastern phoebe
<i>Setophaga americana</i>	Northern parula
<i>Setophaga caerulescens</i>	Black-throated blue warbler
<i>Setophaga coronata</i>	Yellow-rumped warbler
<i>Setophaga dominica</i>	Yellow-throated warbler
<i>Setophaga discolor</i>	Prairie warbler
<i>Setophaga magnolia</i>	Magnolia warbler
<i>Setophaga palmarum</i>	Palm warbler
<i>Setophaga petechia</i>	Yellow warbler
<i>Setophaga pinus</i>	Pine warbler
<i>Setophaga ruticilla</i>	American redstart
<i>Setophaga striata</i>	Blackpoll warbler
<i>Seiurus aurocapillus</i>	Ovenbird
<i>Parkesia noveboracensis</i>	Northern waterthrush
<i>Sialis sialis</i>	Eastern bluebird
<i>Sitta carolinensis</i>	White-breasted nuthatch
<i>Sitta canadensis</i>	Red-breasted nuthatch
<i>Sitta pusilla</i>	Brown-headed nuthatch
<i>Spinus pinus</i>	Pine siskin
<i>Spizella passerina</i>	Chipping sparrow
<i>Spizella pusilla</i>	Field sparrow
<i>Stelgidopteryx serripennis</i>	Northern rough-winged swallow
<i>Sturnus vulgaris</i>	European starling
<i>Tachycineta bicolor</i>	Tree swallow
<i>Thryothorus ludovicianus</i>	Carolina wren
<i>Toxostoma rufum</i>	Brown thrasher
<i>Troglodytes aedon</i>	House wren
<i>Troglodytes troglodytes</i>	Winter wren
<i>Turdus migratorius</i>	American robin
<i>Tyrannus tyrannus</i>	Eastern kingbird
<i>Vireo griseus</i>	White-eyed vireo
<i>Vireo olivaceus</i>	Red-eyed vireo
<i>Vireo solitarius</i>	Blue-headed vireo
<i>Leiothlypis celata</i>	Orange-crowned warbler
<i>Zonotrichia albicollis</i>	White-throated sparrow
Order Piciformes	
<i>Colaptes auratus</i>	Northern flicker

Table 14-3. Birds Observed on JBLE-Eustis

Scientific Name	Common Name
<i>Dryocopus pileatus</i>	Pileated woodpecker
<i>Melanerpes erythrocephalus</i>	Red-headed woodpecker
<i>Picoides villosus</i>	Hairy woodpecker
<i>Picoides pubescens</i>	Downy woodpecker
<i>Melanerpes carolinus</i>	Red-bellied woodpecker
<i>Sphyrapicus varius</i>	Yellow-bellied sapsucker
Order Strigiformes	
<i>Bubo virginianus</i>	Great horned owl
<i>Strix varia</i>	Barred owl
<i>Megascops asio</i>	Eastern screech owl
Order Cuculiformes	
<i>Coccyzus americanus</i>	Yellow-billed cuckoo
Order Caprimulgiformes	
<i>Antrostomus carolinensis</i>	Chuck Will's Widow

14.1.9 Appendix J Fish and Shellfish Observed at JBLE-Eustis

Table 14-4. Fish and Shellfish Observed on JBLE-Eustis

Fish	
Common Name	Scientific Name
American eel	<i>Anguilla rostrata</i>
Atlantic thread herring	<i>Opisthonema oglinum</i>
Atlantic croaker	<i>Micropogonias undulates</i>
Atlantic silverside	<i>Menidia menidia</i>
Bay anchovy	<i>Anchoa mitchilli</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Blackcheek tonguefish	<i>Symphurus plagiusa</i>
Bluefish	<i>Pomatomus saltatrix</i>
Bluegill	<i>Lepomis machochives</i>
Bowfin	<i>Amia calva</i>
Brown bullhead	<i>Ameiurus nebulosus</i>
Channel catfish	<i>Ictalurus punctatus</i>
Common carp	<i>Cyprinus carpio</i>
Golden shiner	<i>Notemigonus crysoleucas</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Hogchoker	<i>Trinectes maculates</i>
Inshore lizqrdfish	<i>Synodus foetens</i>
Largemouth bass	<i>Microjpterus solmoides</i>

Table 14-4. Fish and Shellfish Observed on JBLE-Eustis

Fish	
Common Name	Scientific Name
Mosquitofish	<i>Gambusia affinis</i>
Northern or Southern kingfish	<i>Menticirrhus spp.</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Red ear sunfish	<i>Lepommis microlophus</i>
Rough silverside	<i>Membras martinica</i>
Spot	<i>Leiostomus xanthurus</i>
Striped anchovy	<i>Anchoa hepsetus</i>
Striped killifish	<i>Fundulus majalis</i>
Striped bass	<i>Morone saxatillis</i>
Weakfish	<i>Cynoscion regalsi</i>
White catfish	<i>Ameriurus catus</i>
White crappie	<i>Pomoxis annularis</i>
White mullet	<i>Mugil curema</i>
White perch	<i>Morone Americana</i>
Yellow Bullhead	<i>Ameriurus natalis</i>
Blue crabs	<i>Callinectes sapidus</i>
American oyster	<i>Crassostrea virginica</i>

14.1.10 Appendix K. Reptiles and Amphibians Observed on JBLE-Eustis

Reptiles	
Scientific Name	Common Name
Turtles	
<i>Chelydra serpentina</i>	Snapping turtle
<i>Chrysemys picta picta</i>	Eastern painted turtle
<i>Clemmys guttata</i>	Spotted turtle
<i>Kinosternon subrubrum subrubrum</i>	Southeastern mud turtle
<i>Psudemys rubriventris</i>	Northern red-bellied cooter
<i>Sternotherus odoratus</i>	Eastern musk turtle
<i>Trachemys scripta scripta</i>	Yellow-bellied slider
<i>Trachemys scripta elegans</i>	Red-eared slider
<i>Malaclemys terrapin terrapin</i>	Northern diamond-back terrapin
<i>Terrapene carolina carolina</i>	Woodland box turtle
Snakes	
<i>Carphophis amoenus amoenus</i>	Eastern wormsake
<i>Coluber constrictor constrictor</i>	Northern black racer
<i>Diadophis punctatus</i>	Ring-necked snake
<i>Haldea striatula</i>	Rough earthsnake

<i>Pantherophis alleghaniensis</i>	Eastern ratsnake
<i>Lampropeltis getula getula</i>	Eastern kingsnake
<i>Nerodia sipedon sipedon</i>	Northern watersnake
<i>Opheodrys aestivus aestivus</i>	Northern rough greensnake
<i>Thamnophis sauritus sauritus</i>	Common ribbon snake
<i>Thamnophis sirtalis sirtalis</i>	Eastern gartersnake
<i>Storeria dekayi</i>	Dekay's brownsnake
Lizards	
<i>Plestiodon fasciatus</i>	Common five-lined skink
<i>Plestiodon laticeps</i>	Broad-headed skink
<i>Scincella lateralis</i>	Little brown skink

Amphibians	
Scientific Name	Common Name
Salamanders	
<i>Ambystoma opacum</i>	Marbled salamander
<i>Notophthalmus viridescens viridescens</i>	Red-spotted newt
<i>Plethodon cinereus</i>	Eastern red-backed salamander (red & lead-phases)
Anurans (Frogs & Toads)	
<i>Acris</i> sp.	Cricket frog (species not specified)
<i>Gastrophryne carolinensis</i>	Eastern narrow-mouth toad
<i>Hyla chrysoscelis</i>	Cope's gray treefrog
<i>Hyla cinerea</i>	Green treefrog
<i>Pseudacris crucifer</i>	Spring peeper
<i>Pseudacris feriarum</i>	Upland chorus frog
<i>Lithobates catesbeianus</i>	American bullfrog
<i>Lithobates clamitans</i>	Green frog
<i>Lithobates palustris</i>	Pickerel frog
<i>Lithobates sphenoccephalus utricularius</i>	Coastal Plain leopard frog
<i>Lithobates virgatipes</i>	Carpenter frog
<i>Hyla squirella</i>	Squirrel treefrog
<i>Anaxyrus americanus americanus</i>	American toad
<i>Anaxyrus fowleri</i>	Fowler's toad

14.1.11. Appendix L. Insects, Other Arthropods & Other Invertebrates Observed on JBLE-Eustis

1. General. Invertebrate fauna represent a highly significant group of organisms in relation to ecosystem management. Arthropods constitute the predominant group of invertebrates documented at JBLE-Eustis. Inventories of other invertebrates particularly mollusks and annelids are extremely limited. Insects and several arachnid taxa represent the majority of the inventory. Not surprisingly, Coleoptera, Hymenoptera, Lepidoptera, and Diptera comprise the largest documented orders. Odonata are common as expected; however, this group has not received as much attention and more data is needed. Megaloptera is expected but also requires more attention. Only one ephemeropteran was observed. Plecoptera (stoneflies) are not expected based on insufficient habitat type and remain undocumented. Trichoptera (caddisflies) remained undocumented until immature stage specimens were observed in Eustis Lake during a 2022 survey (and reported in 2023). The classes Protura, Collembola and Diplura are expected but remain undocumented. Araneae and Ixodida are well represented but additional inventory is needed. Decapoda, other crustaceans, Chilopoda, and Diplopoda as well as Opiliones have limited representation and require considerable review. Insects, though well represented, warrant continuous examination due to their vast diversity and subsequent relationships in the installation ecosystem as well as potential establishment of invasive taxa of this class (including but not limited to forest pests and some other arthropods such as ticks) as well as native fauna that affect the ecosystem.
2. Data sources:
 - a. An Inventory of Insect and Medically Important Arthropod Taxa at Joint Base Langley-Eustis, JBLE-Eustis, Virginia (Christensen, February 2014).
 - b. Forest Insect Survey at Joint Base Langley-Eustis, JBLE-Eustis, Virginia, by A. Evans (Parsons, December 2015).
 - c. Tick & Tick-Borne Disease Threat Assessment (USA Public Health Command and the College of William & Mary, 2007-2019 which includes bird and mammalian host surveys).
 - d. 2017 Mosquito Species Inventory (Christensen, 2017).
 - e. Planning Level Surveys for Amphibians and Reptiles, Mammals, Birds, and Fish, As Well As Pest Insects and Invasive Plants at FE, Virginia in 2004-2005 (Versar, August 2006).
 - f. Insects, Other Arthropods & Other Macroinvertebrates Observed on JBLE-Eustis: Understanding the Significance of Invertebrate Taxa on Military Missions (Original and Updates #1-4).
 - g. Benthic Macroinvertebrate Baseline Sampling, Brown's Lake, JBLE-Eustis, Virginia, Malcom-Pirnie, 29 Nov 2006.
 - h. Seres Arcadis Joint Venture. 2024. Draft Final 2023 Annual Long Term Monitoring Report. Mid-Atlantic Group Optimized Remediation Contract. Joint Base Langley Eustis – JBLE-Eustis, Virginia. January.
 - i. Data from previous INRMPs.
 - j. Annual records.

- k. Integrated pest management reports.
 - l. Historical collections and photographs.
3. Invertebrate inventories.

a. Consolidated Invertebrate Inventory Categories as of 2023.

Table 14-5. Insects, Other Arthropods & Other Invertebrates Observed on JBLE-Eustis

Orders	Families	Genera	Species
Class Insecta (Insects)			
Blattodea (Cockroaches & Termites)	4	6	5
Coleoptera (Beetles)	71	328	379
Dermaptera (Earwigs)	2	2	2
Diptera (True Flies)	25	52	59
Ephemeroptera (Mayflies)	1	—	—
Hemiptera (True Bugs, Cicadas, Hoppers, Aphids & Allies)	22	35	37
Hymenoptera (Bees, Wasps, Hornets, Sawflies & Ants)	25	45	45
Lepidoptera (Butterflies, Moths & Skippers)	25	123	123
Mantodea (Mantids)	1	2	2
Mecoptera (Scorpionflies, Hangingflies & Allies)	1	—	—
Megaloptera (Alderflies, Dobsonflies & Fishflies)	2	1	----
Microcoryphia (Bristletails)	1	—	—
Neuroptera (Antlions, Owlflies, Lacewings & Mantidflies)	5	2	2
Odonata (Grasshoppers, Katydid & Crickets)	5	7	4
Orthoptera (Grasshoppers, Katydid & Crickets)	5	14	11
Phasmida (Stick Insects)	1	—	—
Psocodea (Barklice, Booklice & Parasitic Lice)	1	1	1
Trichoptera (Caddisflies)	1	1	---
TOTALS:	199	619	670
Class Arachnida (Arachnids)			
Araneae (True Spiders)	16	30	31
Mesostigmata (Mites)	2	2	2
Trombidiformes (Mites)	6	8	1
Ixodida (Ticks)	1	4	8
Opiliones (Harvestmen, Daddy Longlegs)	1	1	
Pseudoscorpiones (Pseudoscorpions)			
TOTALS:	26	46	42
Subphylum Crustacea/Class Malacostraca (Amphipods, Isopods, and Decapods)			
4	5	6	7
Class Diplopoda (Millipedes)			
2	2	2	2
Class Chilopoda (Centipedes)			

Table 14-5. Insects, Other Arthropods & Other Invertebrates Observed on JBLE-Eustis

Orders	Families	Genera	Species
2	1	1	1
Phylum Mollusca/Class: Bivalva (Clams, Oysters, Mussels, & Scallops)			
1	1	2	2

Phylum Mollusca/Class: Gastropoda (Slugs and Snails)			
1	2	2	-----
Phylum Annelida/Class: Clitellata (Segmented worms) at JBLE-Eustis.			
2	2	1	1
Phylum Annelida/Class: Oligochaeta (Segmented worms) at JBLE-Eustis			
1	1	4	3
Phylum: Platyhelminthes (Flatworms)/Class: Rhabditophora at JBLE- Eustis			
1	1	1	1

- b. Insect taxa (Class Insecta) documented. This section lists the insect taxa documented on the installation. Taxa were identified to lowest taxonomic level possible which may be family, genus, or species. Additionally, each taxon was assigned an abbreviated code pertaining to status or relationship with the installation ecology:

A = Adventive. Non-native organisms introduced into new areas. May or may not be invasive.

B = Beneficial. Natural enemy of a pest or potential pest (plant or animal) that might affect missions. Definition does not include pollinators, generalist predators, or decomposers.

C = Cosmopolitan. Organisms occurring virtually worldwide.

NB = Nuisance Biting or Stinging. Insects/other arthropods that bite humans or sting in defense to include those considered medically significant.

DV = Disease Vector. Capable of transmitting pathogens to humans, domestic animals, & wildlife.

FP = Forest Pest. May have the potential to cause significant damage to trees/forest stands. This includes species that may vector disease pathogens to trees or other plants. Could affect training area quality, promote erosion, promote invasive vegetation growth, impact aesthetics, and impact recreational hunting.

I = Invasive. Non-native organisms that proliferates to create serious conditions affecting native fauna or habitat.

LDR = Federally/State Listed, Rare or Declining.

NB = Nuisance Biting or Stinging. Insects/other arthropods that bite humans or sting in defense to include those considered medically significant.

NE = Native to the area; considered an ecological component of the installation's natural system.

OP = Other Pest. Creates undesirable conditions by means other than biting, stinging or forestry impacts.

WP = Wildlife Pest. Adversely affects health of a given wildlife groups or species. Usually, parasitic.

? = Uncertain on identification.

?? = Uncertain whether adventive, native, or cosmopolitan.

Table 14.7: Insect order taxa numbers by relationship code

ORDER	B	NB	DV	A	I	FP	OP	WP	LRD	NE	
Blattodea				3			2			1	
Coleoptera	11			31	9	14	8	1		369	
Dermaptera				2							
Diptera	1	40	20	5	4		1	26		49	
Ephemeroptera										1	
Hemiptera		4		3	1	3	3	1		38	
Hymenoptera	8	6		5	2		1	1	2	45	
Lepidoptera	2	2		1		3	1		2	124	
Mantodea				1	1?					1	
Mecoptera										?	
Megaloptera										1	
Microcoryphia										1	
Neuroptera										6	
Odonata										6	
Orthoptera							1			13	
Phasmida											
Psocodea		1									
Trichoptera										1	

4. Insect taxa documented on JBLE-Eustis.

Order Blattodea (Cockroaches and Termites).

Blaberidae

Panchlora nivea (A)

Blattidae

Eurycotis (?)

Parcoblatta (NE)

Periplaneta americana (C, OP)

Periplaneta fuliginosa (A, OP)

Ectobiidae

Blattella germanica (C, OP)

Ectobius (A)

Ectobius pallidus (A)

Rhinotermitidae (Subterranean Termites?) (C)

Order Coleoptera (Beetles).

Aderidae (Ant-like Leaf Beetles)

Zonantes subfasciatus (NE)

Alleculidae? (Comb-clawed Beetles)

Anthicidae (Antlike Flower Beetles)

Notoxus murinipennis (NE)

Anthribidae (Fungus Weevils)

Euparius marmoreus (NE)

Euparius paganus (NE)

Ormiscus sp. (No known non-native species in US)

Archeocrypticidae (Cryptic Fungus Beetles)

Enneboeus caseyi (NE)

Attelabidae (Leaf Rolling Weevils)

Pterocolus ovatus (NE)

Bostrichidae (Horned Powder-post Beetles)

Amphicerus bicaudatus (NE)

Prostephanus punctatus (NE)

Xylobiops basilaris (NE)

Brachyceridae (No common name groupings)

Lissorhoptrus lacustris (NE)

Notiodes cribricollis (NE)

Tanysphyrus lemnae (NE)

Brentidae (Primitive Weevils)

Arrhenodes minutus (NE)

Buprestidae (Metallic Wood-boring Beetles)

Acmaeodera ornata (NE)

Acmaeodera tubulus (NE)

Agrilus celti (NE)

Agrilus ruficollis (NE)

Brachys aerosus (NE)

Brachys aeruginosus (NE)

Brachys floricola (NE)

Buprestis apricans (NE)
Buprestis lineata? (NE)
Buprestis maculipennis (NE)
Buprestis rufipes (NE)
Chalcophora virginensis (NE)(FP?)
Chrysobothris femorata (NE)
Chrysobothris orono (NE)
Dicerca juncea (NE, new state record when observed in 2015)
Dicerca lepida (NE)
Dicerca lurida (NE)
Dicerca obscura (NE)
Pachyschelus laevigatus (NE)
Paragrillus tenuis (NE)
Spectralia gracilipes (NE)
Taphrocerus howardi (NE)

Callirhipidae (Callirhipid Cedar Beetles)

Zenoa picea (NE)

Cantharidae (Soldier Beetles)

Atalantycha bilineata (NE)
Chauliognathus marginatus
Chauliognathus pennsylvanicus (NE)
Discodon planicollis (NE)

Carabidae (Ground Beetles)

Acupalpus
Acupalpus pauperculus (NE)
Amara sp.
Amphasia interstitialis (NE)
Anisodactylus nigerrimus (NE)
Bradycellus
Bradycellus badipennis (NE)
Calosoma sp.
Calosoma scrutator (NE)
Calosoma wilcoxi (NE)
Cicindela sexguttata (NE)
Cicindela hirticollis (NE)
Cymindis limbata (NE)
Cymindis platicollis (NE)
Ellipsoptera marginata (NE)
Plochionus timidus (NE)
Stenolophus ochropezus (NE)
Tachyta sp. (NE)
Tetracha carolina (NE)
Tetracha virginica (NE)

Cerambycidae (Long-horned Beetles)

Acanthocinus nodosus (NE)
Acanthocinus obsoletus (NE)
Aegomorphus morrisii (NE)
Anelaphus parallelus (NE)
Anelaphus villosus (NE)
Arhopalus rusticus (?)(?)
Asemum sp.
Asemum striatum (NE)
Astylopsis arcuata (NE)
Astylopsis sexguttata (NE)
Ataxia crypta (NE)
Brachyleptura (NE)
Cyrtophorus verrucosus (NE)
Eburia quadrigeminata (NE)
Elaphidion mucronatum (NE)
Elytrimitatrix undata (NE)
Enaphalodes atomarius (NE)
Enaphalodes rufulus (NE, potential FP)
Eudermes pini (NE)
Eupogonius tomentosus (NE)
Gaurotes cyanipennis (NE)
Graphisurus fasciatus (NE)
Leptostylus asperatus ?(NE)
Mallodon dasystemus (NE)(FP)
Molorchus bimaculatus (NE)
Monochamus carolinensis (NE)(potential FP)
Monochamus titillator ?(NE)
Neandra brunnea (NE)
Nealosterna capitata (NE)
Neoclytus acuminatus (NE)
Neoclytus scutellaris (NE)
Oberea tripunctata (NE)
Orthosoma brunneum (NE)
Parelaphidion incertum (NE)
Phymatodes amoenus (NE)
Prionus imbricornis (NE)
Prionus laticollis (NE)
Prionus pocularis (NE)
Psenocerus supernotatus (NE)
Rhagium inquisitor (A)(I?)(FP)
Smodicum cucujiforme (NE)
Sphenostethus taslei (NE)

Strangalia famelica (NE)

Strangalia luteicornis (NE)
Styloleptus biustus (??)
Tessaropa tenuipes (NE)
Typocerus acuticauda (NE)
Typocerus zebra (NE)
Urographis fasciatus (NE)
Xylotrechus colonus (NE)
Xylotrechus convergens (NE)
Xylotrechus sagittatus (NE)
Xylotrechus schaefferi (NE)

Cerophytidae (Rare Click Beetles)
Cerophytum pulsator (NE)

Chelonariidae (Turtle Beetles)
Chelonarium lecontei (NE)

Chrysomelidae (Leaf Beetles)
Altica chalybea (NE)
Bruchidius villosus (A)
Capraita obsidiana (NE)
Cryptocephalus guttulatus (NE)
Demotina modesta (NNA)
Diabrotica undecimpunctata (NE) (OP)
Disonycha (NE)
Donacia (??)
Exema elliptica (NE)
Kuschelina gibbitarsa (NE)
Labidomera clivicollis (NE)
Paria (NE)
Rhabdopterus (NE)

Ciidae (Minute Tree-fungus Beetles)
Cis fuscipes (NE)

Cleridae (Checkered Beetles)
Cymatodera undulata (NE)(B)
Enoclerus sp.
Enoclerus ichneumoneus (NE)(B)
Enoclerus nigripes (NE)(B)
Phyllobaenus corticinus (?), possible error: range is south TX to Guatemala)
Thanasimus dubius (NE)(B)

Coccinellidae (Lady Beetles)
Chilocorus stigma (NE)(B)
Cycloneda (NE)(B)

Diomus amabilis (NE)(B)
Harmonia axyridis (A)(I?)(OP)
Hyperaspis binotata (NE)(B)

Corylophidae (Minute Hooded Beetles)

Holopsis marginicollis (NE)

Cryptophagidae (Silken Fungus Beetles)

Cryptophagus sp. (not identified to species; several adventive in US, maybe A)

Cucujidae (Flat Bark Beetles)

Cucujus clavipes (NE)

Curculionidae (Snout & Bark Beetles)

Ambrosiodmus sp.

Ambrosiodmus rubricollis or *A. obliquus* (*A. rubricollis* is A, I? & potential FP)

Ambrosiodmus obliquus (??)

Ambrosiophilus atratus (A)

Ampelogypter ampelopsis (NE)

Anthonomus signatus (NE)

Apteromechus pumilus (NE, FP?)

Apteromechus ferratus (NE)

Auleutes tenuipes (NE)

Carphoborus bicornus (NE)

Cnesinus strigicollis (NE)

Cnestus mutilatus (A)

Conotrachelus anaglypticus (NE)

Conotrachelus juglandis (NE)

Conotrachelus naso (NE)

Conotrachelus posticatus (NE)

Cophes obtentus (NE)

Cossonus impressifrons (NE)

Curculio sp. (NE)

Cyclorhipidion bodoanum (A)

Cylindrocopturus nanulus (NE)

Cryptorhynchus fuscatus (NE)

Cyrtepidomus castaneus (A)(OP?)

Dendroctonus terebrans (NE)(potential FP)

Dryophthorus americanus (NE)

Dryoxylon onoharaensis (A)

Eubulus bisignatus (NE)

Eubulus obliquefasciatus (NE)

Euplatypus compositus (NE)

Euwallacea validus (A)(I?)(potential FP)

Geraeus picumnus (NE)

Glyptobaris lecontei (NE)

Gnathotrichus materiarius (NE)
Hylastes opacus (NNA)
Hylastes porculus (NE)
Hylastes salebrosus (NE)
Hylastes tenuis (NE)
Hylesinus aculeatus (NE)
Hylesinus fasciatus (NE)
Hylobius pales (NE)(potential FP)
Hylocurus langstoni (NE)
Hylurgops pinifex (NE)
Hylurgops salebrosus (NE)
Hypothenemus (A?)
Idiostethus sp.
Ips avulsus (NE)(potential FP)
Ips grandicollis (NE)(potential FP)
Lechriops oculatus (NE)
Listronotus sparsus (NE)
Madarellus undulates (NE)
Microhyus setiger (NE)
Monarthrum fasciatum (NE)
Myoplatypus flavicornis (NE)
Naupactus cervinus (A)
Nicentrus lecontei (NE)
Odontocorynus calcarifer (NE)
Oedophrys hilleri (*Pseudoedophrys hilleri*)(A)
Orchestomerus marionis (NE)
Orthotomicus caelatus (NE)
Otiorhynchus sulcatus (A)
Oxoplatypus quadridentatus (NE)
Pachylobius picivorus (NE, potential FP)
Pandeleiteius hilaris (NE)
Perigaster cretura (NE)
Perigaster obscura (NE)
Phloeosinus (A?)
Phloeotribus (NE)
Phloeotribus frontalis (NE)
Pissodes (NE)
Pissodes nemorensis (NE)(potential FP)
Pissodes strobi (NE)(potential FP)
Pityogenes meridianus (?) (NE)
Pityophthorus (?)
Pseudopityophthorus minutissimus (NE)
Pseudothysanoes lecontei (NE)
Rhynchus apiculatus (NE)
Rhyncolus discors (NE)
Stenoscelis andersoni (?)

Stenoscelis brevis (NE)
Tachygonus lecontei (NE)
Tychius meliloti (A)
Thysanoes (NE)
Xyleborinus saxesenii (A)(I?)(potential FP?)
Xyleborus sp.
Xyleborus celsus (NE)
Xyleborus ferrugineus (NE)
Xyleborus pfeili (A)(I?)(FP?)
Xyleborus pubescens (NE)
Xylosandrus crassiusculus (A)
Xylosandrus germanus (A)(I?)(potential FP?)
Xylosandrus crassiusculus (A)(i?)(potential FP?)

Dermestidae (Carpet Beetles)

Anthrenus pimpinellae (OP)(C)
Cryptorhopalum sp. (NE)
Dermestes ater (A)

Dytiscidae (Predaceous Diving Beetles)

Copelatus glyphicus (NE)
Dytiscus sp. (NE)

Elateridae (Click Beetles)

Alaus myops (B?, NE)
Alaus oculatus (B?, NE)
Ampedus areolatus (NE)
Ampedus collaris (NE)
Ampedus linteus (NE)
Ampedus nigricollis (NE)
Conoderus lividus (NE)
Dolerosomus silaceus (NE)
Lacon (NE)
Lacon discoideus (NE)
Limonium (Gambrinus) griseus (NE)
Orthostethus infuscatus (NE)

Elmidae (Riffle Beetles)

Stenelmis sp. (NE)

Endomychidae (Handsome Fungus Beetles)

Mycetina perpulchra (NE)
Rhanidea unicolor (NE)

Erotylidae (Pleasing Fungus Beetles)

Ischyryus quadripunctatus (NE)

Toramus pulchellus (NE)

Triplax festiva (NE)

Triplax flavicollis (NE)

Triplax thoracica (NE)

Tritoma unicolor (NE)

Eucinetidae? (Plate-thigh Beetles)(NE)

Eucnemidae (False Click Beetles)

Isorhipis sp. (NE)

Microrhagus sp. (NE)

Geotrupidae (Earth-Boring Scarab Beetles)

Bolbocerosoma farctum (NE)

Haliplidae (Crawling Water Beetles)

Peltodytes sp. (NE)

Heteroceridae (Variegated Mud-loving Beetles)

Tropicus pusillus (NE)

Histeridae (Clown Beetles)

Platysoma aurelianum (NE)

Platysoma leonti (NE)

Hybosoridae (Scavenger Scarab Beetles)

Hybosorus illigeri (A)

Germarostes globosus (NE)

Hydraenidae (Minute Moss Beetles)

Hydraena sp. (NE)

Hydrophilidae (Water Scavenger Beetles)

Enochrus ochraceus (NE)

Laemophloeidae (Lined Flat Bark Beetles)

Charaphloeus convexulus (NE)

Laemophloeus biguttatus (NE?)

Lampyridae (Fireflies)

Ellychnia corrusca (NE)

Lucidota atra (NE)

Photinus sp. (NE)

Latridiidae (Minute Brown Scavenger Beetles)

Corticaria sp. (?)(?)

- Corticarina cavicollis* (NE)
Corticarina gibbosa (A)
Enicmus maculatus (NE)
Melanophthalma sp. (NE)
Leiodidae (Round Fungus Beetles)
Agathidium sp. (NE)
Catops basilaris (??)
- Lucanidae (Stag Beetles)
Platycerus virescens (*Platycerus quercus*)(NE)
- Lycidae (Net-winged Beetles)
Eropterus sp. (NE)
- Lymexylidae (Ship-timber Beetles)
Melittomma sericeum (NE)
- Melandryidae (False Darkling Beetles)
Dircaea liturata (NE)
Melandrya striata (NE)
- Melyridae (Soft-winged Flower Beetles)
Hypebaeus oblitus (??)
- Meloidae (Blister Beetles)
Epicauta funebris (NE)
Epicauta vittata (NE)
Lytta aenea (NE)
Lytta polita (NE)
Meloe sp. (NE)
- Monotomidae (Root-eating Beetles)
Rhizophagus sp. (??)
- Mordellidae (Tumbling Flower Beetles)
Falsomordellistena hebraica (NE)
Mordellaria serval (NE)
Mordellina ancilla (NE)
Mordellistena liturata (NE)
Mordellistena testacea (NE)
Mordellistena trifasciata (NE)
Mordellochroa scapularis (NE)
Tomoxia lineella (??)
- Nitidulidae (Sap-feeding Beetles)
Aethina tumida (A)(I?)(WP)

Amphicrossus ciliatus (NE)
Carpophilus sayi (NE((potential FP)
Colopterus maculatus (NE)
Colopterus unicolor (NE)
Cryptarcha ampla (NE)
Cryptarcha strigatula (NE)
Epuraea peltoides (NE)
Glischrochilus obtusus (NE)
Lobiopa undulata (NE)
Prometopia sexmaculata (NE)
Stelidota sp. (NE)

Oedemeridae (False Blister Beetles)

Asclera ruficollis (NE)
Oxycopsis suturalis (NE)
Oxycopsis thoracica (NE)

Passalidae (Bess Beetles)

Odontotaenius disjunctus (NE)

Phalacridae (Shining Flower Beetles)

Stilbus sp. (NE)

Ptilodactylidae (Toe-winged Beetles)

Anchytarsus bicolor (NE)
Ptilodactyla sp. (NE)

Ptinidae (Death-watch and Spider Beetles)

Caenocara sp. (NE)
Ptinus bimaculatus (NE)
Ptinus (?) *ruficornis*? (??)

Pyrochroidae (Fire-Colored Beetles)

Neopyrochroa femoralis (NE)

Rhysodidae (Wrinkled Bark Beetles)

Omoglymmius americanus (NE)

Scarabaeidae (Scarab Beetles)

Anomala binotata (NE)
Anomala marginata? (NE)
Ataenius sp. (NE)
Ataenius imbricatus (NE)
Ataenius spretulus (NE)(OP)
Calamosternus granarius (*Aphodius granarius*) (NE)(C)
Callistethus marginatus (NE)
Canthon (NE)
Canthon pilularius (NE)

Copris minutus (NE)
Cotinus nitida (NE)(potential OP)
Cyclocephala borealis (NE)
Deltochilum gibbosum (NE)
Dichotomius carolinus (NE)
Diplotaxis liberta (NE)
Dyscinetus morator (NE)
Dynastes tityus (NE)
Euetheola humilis (?)(??)
Euphoria herbacea (NE)
Euphoria sepulcralis (NE)
Gnorimella maculosa (NE)
Hoplia trivialis (NE)
Macroductylus angustatus (NE)
Maladera castanea (A)
Onthophagus hecate (NE)
Onthophagus pennsylvanicus (NE)
Onthophagus subaeneus (NE)
Pelidnota punctata (NE)
Phanaeus vindex (NE)
Phileurus truncatus (NE)
Phyllophaga sp.
Phyllophaga anxia (NE)
Phyllophaga ephilida (NE)(OP? = turfgrass?)
Phyllophaga fraterna (??)
Phyllophaga fusca (NE)
Phyllophaga hirsute (?)(??)
Phyllophaga marginalis (NE)
Phyllophaga micans (NE)
Phyllophaga quercus (NE)
Plectris aliena? (A)
Popillia japonica (A)(I)(OP)
Serica atracapilla (??)
Serica mystaca (NE)
Trigonopeltastes delta (NE)
Valgus (4 spp in US; 1 A but uncertain for JBLE-Eustis)
Valgus canaliculatus (NE)
Valgus seticollis (NE)
Xyloryctes jamaicensis (NE)

Scirtidae (Marsh Beetles)

Contacyphon (originally reported in 2015 survey as *Cyphon* (but *Cyphon* genus no longer used; genus changed to *Contacyphon*?) (?? - genus is C)

Silphidae (Carrion Beetles)

Necrodes surinamensis (NE)

Necrophila americana (NE)
Nicrophorus orbicollis (NE)
Nicrophorus tomentosus (NE)
Oiceoptoma inaequale (NE)
Oiceoptoma noveboracense (NE)

Sphindidae (Cryptic Slime Mold Beetles)

Sphindus americanus (NE)

Staphylinidae (Rove Beetles)

Arpedium sp. (NE)
Asclera ruficollis (NE)
Creophilus maxillosus (?? - 2 subspecies; 1 is A)
Hesperus apicalis (?) (NE)
Hesperus baltimorensis (NE?)
Platydracus exulans (?), (NE)
Sepedophilus sp. (NE)

Sylvanidae (Silvanid Flat Bark Beetles)

Silvanus sp. (?? - 6 of 9 species are A)

Synchroidae (Synchroa Bark Beetles)

Synchroa punctata (NE)

Tenebrionidae (Darkling Beetles)

Alobates pennsylvanica (*A. pennsylvanicus*) (NE)
Centronopus calcaratus (NE)
Corticeus parallelus (NE)
Corticeus thoracicus (NE)
Helops aereus (*Nalassus aereus*) (NE)
Isomira pulla (NE)
Isomira sericea (NE)
Merinus laevis (NE)
Neomida bicornis (NE)
Pseudocistela amoena (*Chromatia amoena*) (NE)
Platydema excavatum (NE)
Platydema flavipes (NE)
Platydema ruficorne (NE)
Platydema subcostatum (NE)
Statira basalis (NE)
Statira gagatina (NE)
Tharsus seditiosus (*Metaclisa seditiosa*) (NE)
Uloma punctulata (NE)
Xylopinus saperdoides (NE)

Tetratomidae (Polypore Fungus Beetles)

Eustrophopsis bicolor (NE)
Eustrophus tomentosus (NE)
Penthe pimelia (NE)
Synstrophus repandus (NE)
Trogidae (Hide Beetles)
Trox sp. (NE)

Trogossitidae (Bark-gnawing Beetles)

Corticotomus parallelus (NE)
Temnoscheila virescens (NE)
Tenebroides collaris (NE)(B?)—may be predator of SPB or other scolyids assoc w/ pine ?)
Tenebroides corticalis (NE)
Tenebroides sp.
Tenebroides laticollis (NE)

Zopheridae (Ironclad Beetles)

Aulonium parallelopipedum (NE)
Bitoma quadriguttata (NE)
Colydium lineola (NE)
Hyporhagus punctulatus (NE)
Microsicus parvulus (*Synchita parvula*) (NE)
Namunaria guttulata (NE)
Pycnomerus sulcicollis (NE)

Order Dermaptera (Earwigs).

Carcinophoridae? / Anisolabididae
Euborellia annulipes (A)

Forficulidae

Forficula auricularia (A)

Order Diptera (True flies).

Asilidae (Robber Flies)

Diogmites sp. (NE)
Efferia sp. (NE)
Promachus sp. (NE)

Bibionidae (March Flies) (NE)

Bibio sp.
Bibio femoratus (?) (NE)

Bombyliidae (Bee Flies)

Bombylius major (NE)
Xenox tigrinus (B)(NE)

Calliphoridae (Blow Flies).

Lucilia sp. (NE)

Cecidomyiidae (Gall Midges and Wood Midges)

Polystepha pilulae (??)

Taxodiomyia cupressi (??)

Taxodiomyia cupressiananassa (??)

Taxodiomyia taxodii (??)

Ceratopogonidae (Biting Midges)

Culicoides sp. (NE)(NB)(WP)(DV)

Chaoboridae (Phantom Midges)

Chaoborus sp. (NE)

Chironomidae (Non-biting Midges)(NE)

Ablabesmyia (*Ablabesmyia*) sp. (??)

Benthalia natchitochae

Cladotanytarsus sp. (??)

Coelotanypus sp. (??)

Cricotopus sp. (NE)

Cryptochironomus sp.

Cryptotendipes sp. (??)

Dicrotendipes sp. (??)

Dicrotendipes modestus (??)

Glyptotendipes sp. (??)

Kiefferulus sp. (??)

Polypedilum halterale gr. (??)

Procladius sp. (??)

Stenochironomus sp.

Tanypus sp. (?? - genus is C)

Tanytarsus sp. (??)

Zavreliella marmorata (??)

Corethrellidae (not identified below family)

Culicidae (Mosquitoes)

Aedes sp.

Aedes albopictus (A)(I)(NB)(DV)

Aedes (*Ochlerotatus*) *c. canadensis* (??)(NB)(WP/parasitizes any vertebrate)

Aedes cinereus (A?)(NB)(C)

Aedes j. japonicas (*Ochlerotatus japonicas*) (A)(I?)(NB)(DV)(WP)

Aedes sollicitans (*Ochlerotatus sollicitans*) (NE)(NB)(DV)

Aedes taeniorhynchus (*Ochlerotatus taeniorhynchus*)(NE)(NB)(DV)

Aedes triseriatus (*Ochlerotatus triseriatus*) (NE)(NB)(DV)(WP [squirrels])

Aedes trivittatus? (*Ochlerotatus trivittatus*) (??)(NB)

Aedes vexans (NB)(DV)(WP [mammalian hosts])(C)
Anopheles sp.
Anopheles quadrimaculatus (NE?)(NB)(DV)
Anopheles bradleyi? (member of *An. crucians* complex) (NE)(NB)
Anopheles crucians (NB)(NE?)
Anopheles punctipennis (NE?)(NB)(DV?)
Coquillettidia perturbans (C)(NB)(DV)
Culex sp.
Culex erraticus (NB)(WP [birds])
Culex nigripalpus (NB)(DV)(A)(I?)
Culex pipiens (NB)(DV)(WP [birds])
Culex pipiens-quinquefasciatus (NB)(DV)(WP [birds])(A)(I?)
Culex restuans (NE?)(NB)(DV)
Culex salinarius (NE?)(NB)(WP [birds and mammals])
Culex territans (NE)(WP [amphibians and reptiles])
Culiseta impatiens (??)(NB)
Culiseta inornata (NE?)(NB)(DV?)
Ochlerotatus hendersoni (NE)(NB)(WP [mammals])
Ochlerotatus infirmatus/Aedes infirmatus (NB)(WP [general feeder])
Orthopodomyia signifera (NE?)(NB)(possible DV)(WP [birds])
Psorophora sp.
Psorophora ciliata (NE?)(NB)(WP [mammals])
Psorophora columbiae (NE)(NB)(WP [mammals])
Psorophora ferox (NE)(NB)(WP [mammals])
Psorophora mathesoni? (NE?)(NB)
Uranotaenia sapphirina (NE?)(not a NB of humans)(WP [amphibians and reptiles])

Drosophilidae (Vinegar Flies)

Drosophila suzukii (A)

Fanniidae (no common name grouping)

Fannia sp.(?) (NE)

Muscidae (House Flies & Kin)

Musca domestica (C)(DV)(OP)

Mydidae (Mydas Flies)

Mydas clavatus? (Only species in eastern US?)

Oestridae (Bot Flies)

Cephenemyia phobifer (NE, WP [deer])

Psychodidae (Moth Flies and Sand Flies)

Clogmia albipunctata (C)

Pyrgotidae (No common name grouping)

Pyrgota undata (NE)

Rhagionidae (Snipe Flies)

Chrysopilus thoracicus (NE)

Sarcophagidae (Flesh Flies)(NE)

Simuliidae (Black Flies)(NE)

Syrphidae (Syrphid Flies)

Eristalis transversa (NE)

Mallota sp. NE)

Meromacrus acutus (NE)

Syrphus sp.

Tabanidae (Horse, Yellow Flies of the Great Dismal Swamp and Deer Flies)

Chrysops sp. (NE)(NB)(DV?)(WP)

Chrysops dimmocki (NE)(NB)(DV)(WP)

Diachlorus ferrugatus (NE)(NB)(WP)

Tabanus sp. (NE)(NB)(WP)

Tabanus atratus? (NE)(NB)(DV)(WP)

Tabanus fuscicostatus (NB?)(DV?)

Tabanus lineola (NE)(NB)(WP)

Tabanus nigrovittatus (NE)(NB?)(WP?)

Tabanus stygius (NE)(NB?)(WP?)

Tabanus sulcifrons (NE)(NB?)(WP?)

Tachinidae (Parasitic Flies)(NE)(species data lacking)

Tipulidae (Large Crane Flies)(NE)(species data lacking)

Tipula sp. (NE)

Therevidae (Stiletto Flies)(NE, species data lacking)

Order Ephemeroptera (Mayflies).

Baetidae?

Order Hemiptera (True bugs, cicadas, hoppers, aphids and allies).

Aphalaridae (No common name designation)

Pachypsylla celtidismamma (NE)

Aphididae (Aphids)

Cinara strobi (??)(potential FP)

Grylloprociophilus imbricator (NE)(potential FP)(NB if handled)

Longistigma caryae (NE)(potential FP)

Aleyrodidae (Whiteflies)

Pealius azaleae (??)

Aradidae (Flat Bugs)

Aradus sp. (NE)

Belostomatidae (Giant Water Bugs)

Abedus sp. (NE)

Lethocerus sp.

Cercopidae (Froghoppers)

Prosapia bicincta (NE)

Cicadidae (Cicadas)

Diceroprocta viridifascia (NE)

Neotibicen auletes - *Megatibicen auletes*? (NE)

Neotibicen canicularis (originally reported as *Tibicen canicularis*) (NE)

Neotibicen tibicen (NE)

Cicadellidae (Typical Leafhoppers)

Oncometopia orbona (NE)

Cimicidae (Bed Bugs)

Cimex adjunctus (NE)(potential NB)(WP [bats])

Cimex lectularius (C)(NB)

Coreidae (Leaf-footed Bugs)

Acanthocephala declivis (NE)

Leptoglossus sp.

Leptoglossus corculus (NE)(FP?)

Leptoglossus oppositus (NE)

Leptoglossus fulvicornis (NE)

Leptoglossus phyllopus (NE)

Fulgoridae (Fulgorid Planthoppers)(NE species data lacking)

Gerridae (Water Striders)(NE)

Lygaeidae (Seed Bugs)

Lygaeus kalmia (NE)

Lygaeus turcicus (NE)

Neacoryphus bicrucis (NE)

Oncopeltus fasciatus (NE)

Membracidae (Treehoppers)(NE, species data lacking)

Nepidae (Waterscorpions)

Ranatra sp. (NE)

Notonectidae (Backswimmers)

Notonecta sp. (NE)

Pentatomidae (Stink Bugs)

Banasa euchlora (NE)

Euthyrhynchus floridanus (NE)

Halyomorpha halys (A)(I)(OP)

Plataspidae (a single recently introduced species).

Megacopta cribraria (A)(I)(OP)(potential NB)

Reduviidae (Assassin Bugs)

Apiomerus crassipes (NE)

Arilus cristatus (NE)

Melanolestes picipes (NE)

Pselliopus cinctus (NE)

Sinea sp.

Sinea diadema (NE)

Sirthenea carinata (NE)

Stenopoda spinulosa (NE)

Zelus luridus (NE)

Rhopalidae (Scentless Plant Bugs)

Boisea trivittata (NE)(OP)

Rhyparochromidae (Dirt-colored Seed Bugs)? – NEW for 2023 but unconfirmed ID

Eremocoris borealis?

Tingidae (Lace Bugs)

Stephanitis pyrioides (A)

Order Hymenoptera (bees, wasps, hornets, ants and sawflies).

Ampulicidae (Cockroach Wasps)

Ampulex canaliculata (??)(NE)

Apidae (Cuckoo, Carpenter, Digger, Bumble, and Honey Bees)

Apis mellifera (A)

Bombus impatiens (NE)

Bombus pensylvanicus (NE)(LRD)(potential NB)

Nomada (NE)

Xylocopa virginica (NE)(OP)

Aulacidae (No common name groupings)

Pristaulacus stigmaterus (??) (Genus: C)

Bethylidae (No common name groupings)(NE)

Braconidae (Braconid Wasps)(NE)

Chrysididae (Cuckoo Wasps)(NE)

Colletidae (Cellophane or Plasterer, Masked, and Fork-tongued Bees)

Colletes thoracicus (NE)

Crabronidae (Square-headed Wasps)

Bicyrtes sp. (NE)

Cerceris (genus: C)

Microbembex monodonta (??)

Trypoxylon politum (NE)

Evaniidae (Ensign Wasps)

Evania appendigaster (A)

Hyptia thoracica (NE)

Formicidae (Ants)

Camponotus chromaiodes (NE)

Camponotus pennsylvanicus (NE)

Crematogaster sp. (C)

Formica exsectoides (NE)

Formica pallidefulva (NE)

Solenopsis invicta (NB)(WP)(A)(I)

Halictidae (Sweat, Furrow, Nomiine, and Short-faced Bees)

Halictus sp. (Furrow Bees) (NE)

Ichneumonidae (Ichneumon Wasps)

Megarhyssa macrurus (NE)

Ophion sp. (NE)

Megachilidae (Leafcutter, Mason, and Resin Bees, and allies)

Megachile sp. (NE)

Megachile xylocopoides (NE)(B)

Mutillidae (Velvet Ants)

Dasymutilla occidentalis (NE)(Not a NB unless handled)

Sphaerophthalma sp. (??)

Orussidae (Parasitic Wood Wasps)

Orussus sp. (NE)
Orussus sayii (NE)

Pergidae (Pergid Sawflies) (Acordulecera is only genus in US, NE)

Pompilidae (Spider Wasps)

Entypus sp. (NE)
Tachypompilus ferrugineus (NE)

Rhopalosomatidae (Rhopalosomatid Wasps)

Rhopalosoma nearcticum (NE)

Sapygidae (Sapygid Wasps)

Sapyga centrata (NE)

Scoliidae (Scoliid Wasps)

Scolia bicincta (NE)(B)
Scolia nobilitata (NE)(B)

Siricidae (Horntails)

Sirex nigricornis (NE)

Sphecidae (Thread-waisted Wasps)

Ammophila sp. (NE)(B)
Chalybion californicum (NE)
Eremnophila aureonotata (NE)(B)
Sceliphron caementarium (?) (NE)
Sphecius speciosus (NE)
Sphex ichneumoneus (NE)
Sphex pensylvanicus (NE)(B)

Tenthredinidae (Common Sawflies)

Empria maculata (NE)
Thrinax dubitata (*Hemitaxonus dubitatus*) (??)

Tiphiidae (Tiphiid Wasps) (NE)

Vespidae (Yellowjackets and Hornets, Paper Wasps; Potter, Mason & Pollen Wasps)

Dolichovespula maculata (NE)(NB)
Eumenes fraternus (NE)(B)
Monobia quadridens (NE)(B)
Polistes sp. (NE)(NB)
Polistes dorsalis (NE?)
Polistes exclamans (?) (NE)

Polistes metricus (NE?)
Vespa crabro (A)(I?)
Vespula sp.
Vespula germanica (A)(potential NB)
Vespula maculifrons (NE)(potential NB)
Vespula squamosa (NE)

Order Lepidoptera (moths, butterflies and skippers).

Attevidae (Tropical Ermine Moths)

Atteva aurea (NE)

Crambidae (Crambid Snout Moths)

Chrysendeton sp. (?) (NE)
Crambus sp. (NE)
Desmia sp.
Desmia funeralis (NE)
Microcrambus elegans (NE)
Palpita sp. (NE)
Scoparia sp. (??)
Scybalistodes vermiculalis (??)(??)

Erebidae (No common name grouping)

Apantesis sp. (NE)
Caenurgina erechtea (NE)
Catocala ilia (NE)
Cisthene plumbea (NE)
Estigmene acrea (?) (NE)
Halysidota tessellaris (NE)
Haploa clymene (NE)
Hyphantria cunea (NE, potential FP)
Phoberia atomaris (?) (NE)
Pyrrharctia isabella (NE)
Tetanolita sp. (?) (NE)

Geometridae (Geometrid Moths)

Chlorochlamys chloroleucaria (NE)
Cyclophora sp. (NE)
Cyclophora packardi (NE)
Disclisioprocta stellata (??)
Ematurga amitaria (??)
Epimecis hortaria (NE)
Erannis tiliaria (NE)
Euchlaena sp. (??)
Eupithecia sp. (??)
Eusarca confusaria (??)

Hypagyrtis unipunctata (NE)
Ilexia intractata (NE)
Iridopsis sp.
Iridopsis defectaria (NE)
Lambdina sp. (NE)
Lobocleta sp. (NE)
Nemoria sp. (??)
Patalene olyzonaria (NE)
Phigalia strigataria (NE)
Pleuroprucha insulsaria (NE)
Protoarmia porcelaria (NE)

Glyphipterigidae (Sedge and False Diamondback Moths)

Glyphipterix sp. (?)

Hesperiidae (Skippers)

Achalarus lyciades (NE)
Amblyscirtes vialis (NE)
Anatrytone logan (NE)
Ancyloxypha numitor (NE)
Atalopedes campestris (NE)
Epargyreus clarus (NE)
Erynnis horatius (NE)
Euphyes dion (??)
Euphyes vestris (NE)
Hylephila phyleus (NE)
Lerema accius (NE)
Nastra lherminier (NE)
Panoquina panoquin (NE)
Poanes viator (NE)(B?)
Poanes yehl (NE)
Poanes zabulon (NE)
Polites origenes (NE)
Polites peckius (NE)
Polites themistocles (??)
Pompeius verna (NE)
Pyrgus communis (NE)
Thorybes pylades (NE)
Wallengrenia egeremet (NE)
Wallengrenia otho (NE)

Lasiocampidae (Tent Caterpillar and Lappet Moths)

Malacosoma americana (NE)(potential FP depending on conditions)
Malacosoma disstria (NE)(potential FP depending on conditions)

Lycaenidae (Blues, Coppers, Hairstreaks, Harvesters)

Atlides halesus (NE)(B?)
Calycopis cecrops (?)(NE)
Celastrina ladon (NE)
Cupido comyntas (NE)
Feniseca tarquinius (NE)(B?)
Plebejus sp.
Satyrium calanus (NE)
Satyrium favonius (NE)
Satyrium kingi (NE, rare in SE US)
Satyrium liparops (NE)
Strymon melinus (NE)

Megalopygidae (Flannel Moths)

Megalopyge opercularis (NE)(NB)

Mimallonidae (Sack-bearer Moths)

Lacosoma chiridota (NE)

Noctuidae (Owlet Moths)

Agrotis sp. (NE)
Autographa sp. (NE)
Choephora fungorum (NE)
Trichoplusia ni (NE)

Notodontidae (Prominent Moths)

Heterocampa umbrata (NE)
Nadata gibbosa (NE)

Nymphalidae (Brush-footed Butterflies)

Asterocampa celtis (NE)
Cercyonis pegala (NE)
Chlosyne nycteis (NE)
Cyllopsis gemma (NE)
Danaus plexippus (NE)
Enodia anhedon (NE, now *Lethe anhedon*)
Euptoieta claudia (NE)
Hermeuptychia sosybius (NE)
Junonia coenia (NE)
Libytheana carinenta (NE)
Limenitis archippus (NE)
Limenitis arthemis astyanax (NE)
Megisto cymela (NE)
Nymphalis antiopa (NE, NB)
Phyciodes tharos (NE)
Polygonia comma (NE)
Polygonia interrogationis (NE)

Satyroides appalachia (NE)

Speyeria cybele (NE)

Vanessa atalanta (NE)

Vanessa cardui (??)

Vanessa virginiensis (NE)

Oecophoridae (Concealer Moths)

Inga sparsiciliella (NE)

Papilionidae (Swallowtails & Parnassians)

Eurytides marcellus (NE)

Papilio glaucus (NE)

Papilio palamedes (NE)

Papilio polyxenes (NE)

Papilio troilus (NE)

Pieridae (Whites, Sulphurs, Yellows [Butterflies])

Abaeis nicippe (NE)

Colias eurytheme (NE)

Phoebis sennae (NE)

Pieris rapae (A)

Pyristia lisa (NE)

Pterophoridae (Plume Moths)

Hellinsia balanotes (NE)

Psychidae (Bagworm Moths)(Actual species not identified; family: C)(OP)(FP)

Pyralidae ((Pyralid Moths)

Hypsopygia olinalis (NE)

Peoria approximella (NE)

Pococera sp. (??)(??)

Saturniidae (Giant Silkworm and Royal Moths)

Actias luna (NE)

Antheraea imperialis (??)(NE)

Antheraea polyphemus (NE)

Anisota virginiensis (NE)

Callosamia sp. (NE)

Dryocampa rubicunda (NE)

Eacles imperialis (NE)

Hyalophora cecropia (NE)

Sesiidae (Clearwing Moths)

Hymenoclea sp. (??)

Sphingidae (Sphinx Moths)

Darapsa myron (NE)
Eumorpha pandorus (NE)
Hemaris diffinis (NE)
Lapara coniferarum (NE)
Manduca sexta (NE)

Tineidae (Clothes Moths)

Acrolophus popeanella (NE)

Tortricidae (Tortricid Moths)

Acleris subnivana (??)
Clepsis listerana (NE)

Zygaenidae (Leaf Skeletonizer Moths)

Harrisina americana (NE)
Pyromorpha dimidiata (NE)

Order Mantodea (Mantids). Species information lacking.

Mantidae (no common name grouping)

Stagmomantis carolina (NE)
Tenodera sinensis (A)(I?)

Order Mecoptera (Scorpionflies, Hangingflies and Allies).

Bittacidae

Order Megaloptera (Alderflies, dobsonflies, and fishflies).

Corydalidae (Dobsonflies and Fishflies)

Neohermes (likely either *Neohermes angusticollis* or *Neohermes concolor*)

Sialidae (Alderflies) (??)

Order Microcoryphia (Bristletails).

Meinertellidae (Rock Bristletails) (NE)

Order Neuroptera (Antlions, Owlflies, Lacewings, Mantidflies and Allies).

Ascalaphidae (Owlflies) (NE)

Chrysopidae (Green Lacewings)

Chrysopa sp. (NE)

Chrysopa nigricornis (?)
Chrysoperla rufilabris (NE)

Hemerobiidae (Brown Lacewings)(NE)

Mantispidae (Mantidflies)(NE)

Myrmeleontidae (Antlions)(NE)

Order Odonata (Dragonflies and damselflies).

Aeshnidae (Darners).

Calopterygidae (Broad-winged Damselflies).
Calopteryx sp.

Coenagrionidae (Narrow-winged Damselflies).

Gomphidae (Clubtails).

Libellulidae (Skimmers).

Brachymesia gravida (NE)
Erythemis sp.
Libellula sp.
Pachydiplax longipennis (NE)
Plathemis lydia (NE)
Sympetrum ambiguum (NE)

Order Orthoptera (Grasshoppers, katydids and crickets).

Acrididae (Short-horned Grasshoppers)

Dissosteira sp. (NE)
Dissosteira carolina (NE)
Leptysmia marginicollis (NE)
Melanoplus femurrubrum (NE)
Melanoplus sanguinipes (NE)
Metaleptea brevicornis (NE)
Paroxya clavuliger (NE)

Gryllidae (True Crickets) (NE).

Gryllus sp.
Hapithus agitator (NE)
Velarifictorus micado? (A)

Gryllotalpidae (Mole Crickets).

Neocurtilla hexadactyla (NE)(OP).

Rhaphidophoridae (Camel Crickets).

Ceuthophilus sp. (NE)

Tettigonidae (Katydids).

Atlanticus sp. (NE)

Microcentrum sp. (NE)

Microcentrum retinerve (NE)

Neoconocephalus sp. (NE)

Orchelimum vulgare (NE)

Order Phasmida (Stick Insects). (NE)

Phasmatidae

Order Psocodea (Barklice, Booklice, and Parasitic Lice).

Trichodectidae

Trichodectes canis (NB of military working dogs & pets, WP)

Order Trichoptera (Caddisflies).

Leptoceridae

Oecetis sp.

5. Arachnid taxa (Class Arachnida) documented. This section lists the arachnid taxa documented on the installation. Taxa were identified to lowest taxonomic level possible which may be family, genus, or species. Additionally, each taxon was assigned an abbreviated code pertaining to status or relationship with the installation ecology:

A = Adventive. Non-native organisms introduced into new areas. May or may not be invasive.

C = Cosmopolitan. Organisms occurring virtually worldwide.

DV = Disease Vector. Capable of transmitting pathogens to humans, domestic animals, & wildlife.

NB = Nuisance Biting or Stinging. Insects/other arthropods that bite humans or sting in defense to include those considered medically significant.

NE = Native to the area; considered an ecological component of the installation's natural system.

WP = Wildlife Pest. Adversely affects health of a given wildlife groups or species. Usually parasitic.

? = Uncertain on identification.

?? = Uncertain whether adventive, native, or cosmopolitan.

Order Araneae (True spiders).

Agelenidae (Funnel Weavers)

Agelenopsis sp. (NE)

Anyphaenidae (Ghost Spiders)

Hibana gracilis (NE)

Araneidae (Orb Weavers)

Argiope aurantia (NE)

Araneus marmoreus (NE)

Araneus pagnia (NE)

Gasteracantha cancriformis (NE)

Larinioides cornutus (NE)

Larinioides sclopetarius (NE)

Neoscona crucifera (NE)

Neoscona domiciliorum (NE)

Trichonephila clavipes (NE)

Ctenidae (Wandering Spiders)(NE)

Filistatidae (Crevice Weavers)

Kukulcania sp.

Kukulcania hibernalis (NE)

Gnaphosidae (Ground Spiders)(NE)

Drassyllus depressus (NE)

Callilepis pluto (NE)

Halonoproctidae (Cork-lid trapdoor spiders)

Ummidia audouini (NE)

Lycosidae (Wolf Spiders)

Hogna sp.? (NE)

Rabidosa sp. (NE)

Rabidosa rabida (NE)

Rabidosa punctulata (NE)

Schizocosa sp. (NE)

Philodromidae (Running Crab Spiders)

Philodromus vulgaris (NE)

Pholcidae (Cellar Spiders)(NE)

Pholcus phalangioides (C) Typically synanthropic.

Pisauridae (Nursery Web & Fishing Spiders)

Dolomedes albineus (NE)
Dolomedes tenebrosus (NE)
Dolomedes triton (NE)

Salticidae (Jumping Spiders)

Colonus sylvanus (NE)
Lyssomanes viridis (NE)
Pelegrina galathea (NE) NEW
Phidippus sp.
Phidippus audax (NE)
Platycryptus sp. (NE)
Platycryptus undatus (NE)

Segestriidae (Tube Web Spiders)(?)

Ariadna bicolor (?) (NE)

Tetragnathidae (Long-jawed Orb Weavers)

Leucauge venusta (NE)
Tetragnatha sp. (NE)
Tetragnatha viridis (NE)

Theridiidae (Cobweb Spiders)

Latrodectus mactans (NE)(potential NB)
Steatoda sp.
Steatoda grossa (NE)

Thomisidae (Crab Spiders) (NE)

Xysticus transversatus (NE)

Order Ixodida (Subclass Acari (Mites and Ticks, Order = Ticks).

Ixodidae (Hard Ticks).

Amblyomma americanum (NB)(DV)(WP)
Amblyomma maculatum (NB)(DV)(WP)
Dermacentor variabilis (NB)(DV)(WP)
Haemaphysalis leporispalustris (NB)(DV?)(WP)
Ixodes affinis (NB?)(DV?)(WP)
Ixodes rugosus? (NB?)(DV?)(WP)
Ixodes scapularis (NB)(DV)(WP)
Rhipicephalus sanguineus (NB)(DV)(WP)

Order: Mesostigmata (mites).

Dermanyssidae

Steatonyssus ceratognathus (NE)(WP)

Macronyssidae

Ornithonyssus sylviarum (NE)(potential NB)(WP)

Order Opiliones (Harvestmen, daddy-longlegs).

Sclerosomatidae

Leiobunum sp. (??)(??)

Order Pseudoscorpiones (Pseudoscorpions). Observed and identified only at order level.

Order: Trombidiformes (mites).

Arrenuridae

Arrenurus sp. (??)

Krendowskiidae (??)

Krendowskia sp. (??)

Oxidae (??)

Oxus sp. (??)

Unionicolidae (??)

Koenikea sp. (??)

Neumania sp. (??)

Tetranychidae (Spider Mites)

Bryobia praetiosa (??)(Clover mite?)

Erythraeidae

Balaustium sp.(?) (Sidewalk mite?)

Trombidiidae (true velvet mites)

Trombidium sp. (Chigger mite) (NE, NB)

(Additionally phoretic mites observed on cerambycid beetles but taxonomy undetermined.)

6. Other arthropods.

Class Chilopoda (Centipedes).

Order Scutigleromorpha (House Centipedes).

Scutigleridae

Scutigler coleoptrata (House Centipede) (A)(B?-indoor predator of roaches, etc. but may bite if handled)

Class Diplopoda (millipedes).

Order: Polydesmida

Xystodesmidae

Apheloria virginiensis (??)

Order Spirobolida.

Spirobolidae

Narceus americanus-annularis complex (NE)

Class Malacostraca.

Order Isopoda (Isopods: pillbugs, sowbugs, woodlice, roly-poly). Observed but documented at order level.

Order Decapoda.

Ocypodidae (Fiddler Crabs and Ghost Crabs)

Uca pugnax (Atlantic Marsh Fiddler Crab) – family observed/species assumed.

Portunidae (Swimming Crabs)

Callinectes sapidus (Atlantic Blue Crab).

Grapsidae (Marsh Crabs, Shore Crabs, and Talon Crabs)

Sesarma reticulatum

Cambaridae (Crayfish).

Cambarus bartonii bartonii (NE)

Cambarus robustus (NE)

Orconectes immunis (NE)

Order Amphipoda.

Crangonyctidae

Stygobromus araeus (NE)

7. Other invertebrate fauna.

Phylum Mollusca

Class Bivalvia (Clams, cockles, mussels, oysters, scallops)

Order: Unionoida (freshwater mussels, aquatic bivalve molluscs)

Unionidae

Pyganodon cataracta (formerly *Anodonta cataracta* when originally documented)

Elliptio complanata

Class Gastropoda (Slugs and Snails)

Order Hygrophila

Physidae (Bladder snails)

Physella sp.

Planorbidae (Ramhorn snails)

Micromenetus sp.

Phylum: Annelida

Class: Clitellata

Order: Haplotaxida

Lumbricidae (Earthworms)

Class: Clitellata

Subclass: Hirudinida

Order Rhynchobdellida

Glossiphoniidae

Helobdella stagnalis

Class: Oligochaeta

Order: Tubificida

Tubificidae

Naididae

Aulodrilus pigueti

Dero sp.

Haemonais waldvogeli

Limnodrilus hoffmeisteri

Phylum: Platyhelminthes (Flatworms)

Class: Rhabditophora (All parasitic flatworms & most free-living species)

Order: Tricladida (Free-living flatworms)

Geoplanidae (Land planarians or land flatworms)

Bipalium kewense (A(I))

Appendix M. Species of Greatest Conservation Need (GCN) documented on JBLE-Eustis Based on the VA State Wildlife Action Plan (SWAP)

Key:

GCN- Greatest Conservation Need

GCN SWAP Rankings:

A- Managers within the state of Virginia have identified “on the ground” species or habitat management strategies expected to benefit the species; at least some of which can be implemented with existing resources and are expected to have a reasonable chance of improving the species’ conservation status.

B- Managers within the state of Virginia have only identified research needs for the species or managers have only identified “on the ground” conservation actions that cannot be implemented due to lack of personnel, funding, or other circumstance.

C- Managers within the state of Virginia have failed to identify “on the ground” actions or research needs that could benefit this species or its habitat or all identified conservation opportunities for a species have been exhausted.

Table 14-6. Species Rankings

Common Name	Scientific Name	Status
Mammal Species of Special Status		
Little Brown Bat	<i>Myotis lucifugus</i>	State Endangered
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Federally Endangered
Tricolored Bat	<i>Perimyotis subflavus</i>	State Endangered
Cotton Deermouse	<i>Peromyscus gossypinus</i>	GCN: A
Eastern Red Bat	<i>Lasiurus borealis</i>	GCN: A
Hoary Bat	<i>Lasiurus cinereus</i>	GCN: A
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	GCN: A
Southeastern Myotis	<i>Myotis austroriparius</i>	GCN: A
Fish Species of Special Status		
Atlantic Sturgeon*	<i>Acipenser oxyrinchus</i>	Federally Endangered
Alewife*	<i>Alosa pseudoharengus</i>	GCN: A
Blueback Herring*	<i>Alosa aestivalis</i>	GCN: A
American Eel	<i>Anguilla rostrata</i>	GCN: A
Reptile Species of Special Status		
Northern Diamond-back Terrapin	<i>Malaclemys terrapin terrapin</i>	GCN: A
Spotted Turtle	<i>Clemmys guttata</i>	GCN: A
Yellow-bellied Slider	<i>Trachemys scripta scripta</i>	GCN: B
Woodland Box Turtle	<i>Terrapene carolina carolina</i>	GCN: A
Bird Species of Special Status		
American Black Duck	<i>Anas rubripes</i>	GCN: A
American Woodcock	<i>Scolopax minor</i>	GCN: A

Table 14-6. Species Rankings

Common Name	Scientific Name	Status
Belted Kingfisher	<i>Megaceryle alcyon</i>	GCN: B
Black-and-white Warbler	<i>Mniotilta varia</i>	GCN: A
Brown Thrasher	<i>Toxostoma rufum</i>	GCN: A
Chimney Swift	<i>Chaetura pelagica</i>	GCN: B
Clapper Rail	<i>Rallus crepitans</i>	GCN: A
Common Tern	<i>Sterna hirundo</i>	GCN: A
Dunlin	<i>Calidris alpina</i>	GCN: A
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	GCN: A
Field Sparrow	<i>Spizella pusilla</i>	GCN: A
Foster's Tern	<i>Sterna forsteri</i>	GCN: A
Gray Catbird	<i>Dumetella carolinensis</i>	GCN: A
Greater Scaup	<i>Aythya marila</i>	GCN: A
Green Heron	<i>Butorides virescens</i>	GCN: B
Least Bittern	<i>Ixobrychus exilis</i>	GCN: A
Marsh Wren	<i>Cistothorus palustris</i>	GCN: A
Northern Flicker	<i>Colaptes auratus</i>	GCN: B
Northern Harrier	<i>Circus hudsonius</i>	GCN: A
Northern Pintail	<i>Anas acuta</i>	GCN: A
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	GCN: C
Royal Tern	<i>Thalasseus maxima</i>	GCN: A
Rusty Blackbird	<i>Euphagus carolinus</i>	GCN: B
Sanderling	<i>Calidris alba</i>	GCN: A
Short-billed Dowitcher	<i>Limnodromus griseus</i>	GCN: A
Snowy Egret	<i>Egretta thula</i>	GCN: A
Virginia Rail	<i>Rallus limicola</i>	GCN: A
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	GCN: A
Yellow-breasted Chat	<i>Icteria virens</i>	GCN: A
Yellow-crowned Night-heron	<i>Nyctanassa violacea</i>	GCN: A
*Species have been identified as having the potential of occurring on the installation but have not been observed.		
Invertebrates of Special Status		
Monarch Butterfly	<i>Danaus plexippus</i>	GCN: A

14.1.12 Appendix O. US Army Corps of Engineers Norfolk District Wetlands Delineation Letter

Awaiting USACE-Norfolk District to process wetland delineation submitted to the USACE on/about March 2023.

14.1.13 Appendix P. Annual INRMP Review Summary Approval Delegation of Authority



**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 633D AIR BASE WING
JOINT BASE LANGLEY-EUSTIS VA**

OFFICE OF THE COMMANDER

4 October 2021

MEMORANDUM FOR 733 MSG/CC AND 733 CES/CC

SUBJECT: Delegation of Authority for Approval of Integrated Natural Resource Management Plans (INRMP) and INRMP Annual Review Summaries

1. IAW AFMAN 32-7003 (Environmental Conservation) dated 20 Apr 20, paragraph 1.14.8, the Installation Commander may delegate signature authority of INRMPS to no lower than the Support Group commander.
2. I hereby delegate my authority to approve INRMPS and certify the INRMP Annual Review Summaries to the 733d Mission Support Group Commander for JBLE-Eustis.

HARRY D. HUNG, COL, USA
Vice Commander, Joint Base Langley-Eustis

14.1.14 Appendix R. JBLE Environmental Policy Statement

https://www.jble.af.mil/Portals/46/Documents/Eustis%20Environmental/EMS/EMS%20Policy%20Statement%202021%20Signed.pdf?ver=RkPTBrjiA_3fypKeLnihpQ%3d%3d

DRAFT

15.0 ASSOCIATED PLANS

Integrated Pest Management Plan (IPMP) & annual review documents:

<https://www.jble.af.mil/Units/Army/Eustis-Environmental/>

JBLE Bird/Wildlife Air Strike Hazard (BASH) Plan

<http://www.jble.af.mil/Units/Army/Eustis-Environmental/>

Timber Inventory and Forest Management Plan (2021)

<http://www.jble.af.mil/Units/Army/Eustis-Environmental/>

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15.1. Invasive Species Management Plan

1. INTRODUCTION

1.2. Information on invasive species at JBLE-Eustis, JBLE-Eustis.

1.2.1. Definition of invasive species. Executive Order 13112 defines the term as “a species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Generally, this definition refers to those adventive plant and animal species that are not native to Virginia or the eastern United States and could potentially cause ecological damage or other issues impacting the military mission. Invasive organisms known to occur or have potential for establishment on the installation include plants, vertebrate fauna, and invertebrate fauna.

1.2.2. Invasive plants. Currently, 41 adventive plant species have been documented on JBLE-Eustis based on surveys, inventories test plots, and observations by Natural Resources & IPM Team staff since approximately 2004. Each species has varying degrees of invasiveness.

1.2.3. Invasive vertebrate fauna. Primarily this includes coyotes (*Canis latrans*), nutria (*Myocastor coypus*), mute swans (*Cygnus olor*), rock dove (*Columba livia*), European starlings (*Sturnus vulgaris*) and English house sparrows (*Passer domesticus*). Coyotes were documented on the installation in 2008 though their existence was suspected prior to this time frame. The starlings, house sparrows and rock doves are common at JBLE-Eustis as expected in nearly anywhere in North America. Mute swans (*Cygnus olor*) have been observed in the local areas adjacent to JBLE-Eustis but have not yet been documented on the installation. Nutria (*Myocastor coypus*) are known to occur in portions of eastern Virginia. Natural resources staff with augmented support from USDA-WS conducted annual surveys and surveillance with dogs and hair platforms from 2014-2023. No actual nutria nor evidence of their presence has been documented to date. However, one adult may have been observed at the intersection of Wilson Avenue and Pershing Avenue in 2015. This could not be confirmed based on a limited quality photograph.

1.2.5. Invasive invertebrate fauna. Several invertebrate species have been documented at JBLE-Eustis:

- Japanese beetles (*Popillia japonica*)
- Kudzu bug (*Megacopta cribraria*)
- Asian tiger mosquito (*Aedes albopictus*)
- Brown marmorated stink bug (*Halyomorpha halys*).
- Red imported fire ants (*Solenopsis invicta*)
- European hornet (*Vespa crabro*)
- Chinese mantis (*Tenodera sinensis*)
- Hammerhead worm (*Bipalium sp. kewense*)

1.2.6 Invertebrate invasive organisms with potential for establishment on JBLE-Eustis. The following invertebrate organisms could become established on JBLE-Eustis in the near future. Survey work and surveillance are key to managing these pests:

- Red swamp crayfish (*Procambarus clarkii*)
- Rusty crayfish (*Orconectes rusticus*)
- Asian long-horned beetle (*Anoplophora glabripennis*)
- Spongy moth (*Lymantria dispar*)
- Sirex woodwasp (*Sirex noctilio*)
- Spotted lanternfly (*Lycorma delicatula*)
- Redbay ambrosia beetle (*Xyleborus glabratus*)
- Beech scale (*Cryptococcus fagisuga*).
- Yellow-legged (or Asian) hornet (*Vespa velutina*).

2.0 RESPONSIBILITIES

The Natural Resources & IPM Team have overall responsibility for management of all invasive species. The Team performs the following tasks to meet this responsibility:

- Prepares and manages the INRMP and IPMP.
- Ensures the INRMP and IPMP are cross-referenced.
- Prepares and manages the Invasive Species Management Plan.
- Ensures invasive species control actions are done IAW both plans.
- Maintains records of invasive species observations, GIS data, maps, and reports.
- Prepares scopes of work for and oversees contracts related to control of invasive species.
- Performs or contracts monitoring for nutria.
- Obtains DoD pest management certification for Category 2 (forestry), Category 3 (ornamental & turf), Category 5 (aquatics), Category 6 (right of way), Category 7 (Industrial, Institutional, Structural & Health), Category 8 (public health), Category 11 (aerial applications of pesticides).
- Approves contracts/control actions related to invasive species management.

3.0. Information sources. This plan shall be cross-referenced with the JBLE-Eustis Integrated Pest Management Plan (IPMP). The IPMP contains additional information on policies and procedures for management of several invasive organisms discussed here.

4.0. BACKGROUND ON INVASIVE ANIMAL AND PLANT SPECIES.

4.1. Basis for Invasive Species Management. Management of invasive species is paramount to long-term sustainment of natural resources which is necessary to meet continued military mission requirements. Executive Order 13112 (Invasive Species), DODI 4715.03 (Natural Resources Conservation Program) and U.S. Air Force Manual 32-7003 (Environmental Conservation) provide guidance and directives that JBLE-Eustis follows towards managing invasive species.

4.1.1. Executive Order (EO) 13112. EO 13112 established the National Invasive Species Council, co-chaired by the Secretaries of Agriculture, Commerce, and Interior. The National Invasive Species Management Plan recognizes that human activities are the primary means of invasive species introductions. It is a blueprint for federal action to prevent the introduction of invasive species, provide for their control, and minimize their economic, environmental, and human health impacts (National Invasive Species Council, 2001). Indeed, EO 13112 directs federal 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.

4.1.2. Executive Order 13112 identifies actions that may affect the status of invasive species. Subject to availability of appropriations and to the extent practicable and permitted by law, each federal agency shall use relevant programs and authorities to:

- 4.1.2.1. Prevent the introduction of invasive species.
- 4.1.2.2. Detect and control such species in a cost-effective manner.
- 4.1.2.3. Monitor invasive species populations.
- 4.1.2.4. Provide for restoration of native habitats that have been invaded.
- 4.1.2.5. Conduct Research on invasive species to prevent introduction and for scientifically sound control.
- 4.1.2.6. Promote public education on invasive species.

4.1.3. Primary management objectives recommended in Executive Order 13112 are to eradicate small infestations and contain expansive infestations of invasive plants. Early eradication of small infestations will save significant time and money and will be more successful than attempts to eradicate larger infestations later.

4.1.4. This plan is intended to be an annex of the JBLE-Eustis Integrated Natural Resources Management Plan (INRMP) and JBLE-Eustis Integrated Pest Management Plan. It therefore follows integrated pest management techniques. Funding requests for invasive species management is programmed AFCEC-IST. Funding is used to manage those organisms which have the higher levels of impact on military missions. Variations in the priorities may occur annually based on ecological or human activity factors or may be based on the extent of efficacy of techniques. Funds may be used to implement contracts, obtain pesticides, generate planning maps, and purchase related equipment.

4.2. How Invasive Plants Threaten and Degrade Native Habitats.

4.2.1. Invasive plants constitute the majority of invasive species impacts on JBLE-Eustis. However, several vertebrate and invertebrate species have been documented on the installation while others have potential for future establishment as discussed above. These issues are discussed separately in this plan. Invasive plants are defined as plants that reproduce rapidly, spread over large areas of the landscape and have few, if any, natural controls, such as herbivores and diseases, to keep them in check. Many invasive plants share some important characteristics that allow them to grow out of control. These include: (1) spreading aggressively by runners or rhizomes; (2) producing large numbers of seeds that survive to germinate; and (3) dispersing

seeds away from the parent plant through various means such as wind, water, wildlife and people.

4.2.2. If left unchecked, invasive plants can take over natural areas and degrade natural resources. Invasive plants disrupt food webs and compete for limited natural resources. Invasive plants will also displace native plants, including rare species, reducing food and shelter for native wildlife, eliminating host plants of native insects and competing for native plant pollinators. Some invasive species spread so rapidly that they displace most other plants, changing a forest, meadow, or wetland into a landscape dominated by one species. Such “monocultures” (stands of a single plant species) have little ecological value and greatly reduce the natural biological diversity of an area.

4.2.3. Of the 4,000 alien plant species introduced to the United States that have escaped cultivation, approximately 400 are serious invaders. Half this total was introduced for horticultural uses. Others arrived accidentally in seed mixes, packaging materials, ships ballast, and by other means. Invasive plants now infest more than 100 million acres. The Virginia Department of Conservation's Division of Natural Heritage and the Virginia Native Plant Society have identified 115 invasive alien plant species that threaten or potentially threaten natural areas, parks, and other protected lands in Virginia.

4.2.4. The goal of this invasive species management plan is to assess which invasive plant and animal species are having negative impacts on military training, other mission requirements and/or natural areas of the installation and which species should be targeted for management. The plan also discusses why these species should be managed and discusses methods for control.

4.3. INVASIVE PLANT SPECIES FOUND AT JBLE-EUSTIS.

4.3.1. Invasive Plant Species Surveys at JBLE-Eustis.

4.3.1.1. Several surveys have been conducted that led to the development of the original invasive species management plan which focused predominantly on plants. A planning level survey that included invasive vegetation was conducted in 2004-2005 (Versar, 2006). In September 2005, staff from the U.S. Army Environmental Center and BASF conducted a Pest Management Program Assistance Visit that surveyed for invasive plants. Additionally, a Timber Inventory and Forest Management Plan was completed in 2007 which provided additional information on invasive vegetation in installation forest compartments. Collectively, these surveys/reports were incorporated into the JBLE-Eustis Invasive Species Management Plan that was prepared by the U.S. Fish and Wildlife Service in July 2008. From 2009-2011, several invasive species control test plots (JBLE-Eustis Invasive Species Control Test Plots, final report, November 2009) and actual treatment projects were performed. The results were incorporated into this updated plan. Another timber inventory that included assessing invasive plants in forest compartments was completed in 2021.

4.3.1.2. Invasive plants occurring on JBLE-Eustis. The following list represents those adventive plants found on the installation and their rating as to invasiveness in Virginia per the Virginia Invasive Plant Species List in the coastal region (per Virginia Department of Conservation &

Recreation (DCR)/<https://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2023.pdf>):

Norway maple (*Acer platanoides*) - MEDIUM
 Tree of Heaven (*Ailanthus altissima*) - HIGH
 Mimosa tree (*Albizia julibrissa*) - MEDIUM
 Garlic mustard (*Alliaria petiolata*) - HIGH
 Field garlic (*Allium vineale*) - not rated by DCR
 Mugwort (*Artemisia vulgaris*) - not rated by DCR
 Chinese violet (*Asystasia gangetica*) - not rated by DCR
 Paper Mulberry (*Broussonetia papyrifera*) - not rated by DCR
 Oriental bittersweet (*Celastrus orbiculatus*) - HIGH
 Spotted knapweed (*Centaurea biebersteinii*) - not rated by DCR
 Canada thistle (*Cirsium arvense*) - HIGH
 Bull thistle (*Cirsium vulgare*) - MEDIUM
 Field bindweed (*Convolvulus arvensis*) - not rated by DCR
 Asiatic dayflower (*Commelina communis*) - LOW
 Crown vetch (*Coronilla varia*) - not rated by DCR
 Scotch broom (*Cystisus scoparius*) - not rated by DCR
 Orchard grass (*Dactylis glomerata*) - not rated by DCR
 Common teasel (*Dipsacus sylvestris*) - MEDIUM
 Russian olive (*Elaeagnus angustifolia*) - not rated by DCR
 Thorny Olive (*Elaeagnus pungens*) - LOW
 Autumn Olive (*Elaeagnus umbellata*) - HIGH
 Weeping lovegrass (*Eragrostis curvula*) - not rated by DCR
 Tall fescue (*Festuca arundinacea*) - not rated by DCR
 Meadow fescue (*Festuca pratensis*) - not rated by DCR
 Gill-over-the-ground (*Glechoma hederacea*) - MEDIUM
 English Ivy (*Hedera helix*) - MEDIUM
 Japanese hops (*Humulus japonicus*) - MEDIUM
 Hydrilla (*Hydrilla verticillata*) - HIGH
 Yellow Flag Iris (*Iris pseudacorus*) - HIGH
 Shrubby Bushclover (*Lespedeza bicolor*) - LOW
 Chinese lespedeza (*Lespedeza cuneata*) - HIGH
 Chinese Privet (*Ligustrum sinense*) - HIGH
 Japanese Honeysuckle (*Lonicera japonica*) - HIGH
 Morrow's honeysuckle (*Lonicera morrowii*) - HIGH
 Tartarian honeysuckle (*Lonicera tartarica*) - MEDIUM
 Birdsfoot trefoil (*Lotus corniculata*) - not rated by DCR
 Chinaberry (*Melia azedarach*) - not rated by DCR
 Yellow sweet clover (*Melilotus officinalis*) - not rated by DCR
 Nepalese Browntop/Japanese Stiltgrass (*Microstegium vimineum*) - HIGH
 White mulberry (*Morus alba*) - not rated by DCR
 Princess Tree (*Paulownia tomentosa*) - MEDIUM
 Beef Steak Plant (*Perilla frutescens*) - LOW
 Timothy (*Phleum pratense*) - LOW

Common Reed (*Phragmites australis*) - HIGH
 Rough bluegrass (*Poa trivialis*) - MEDIUM
 Japanese knotweed (*Polygonum cuspidatum*) - not rated by DCR
 Mile-a-minute (*Polygonum perfoliatum*) - not rated by DCR
 Golden Bamboo (*Phyllostachys aurea*) - MEDIUM
 Kudzu (*Pueraria montana*) - HIGH
 Callery pear (*Pyrus calleryana*) - MEDIUM
 Lesser celandine (*Ranunculus ficaria*) - not rated by DCR
 Multiflora rose (*Rosa multiflora*) - HIGH
 Wineberry (*Rubus phoenicolasius*) - HIGH
 Common chickweed (*Stellaria media*) - MEDIUM
 Faber's foxtail grass (*Setaria faberi*) - not rated by DCR
 Johnsongrass (*Sorghum halepense*) - HIGH
 Ivy-leaved speedwell (*Veronica hederifolia*) - MEDIUM
 Large periwinkle (*Vinca major*) - LOW
 Common Periwinkle (*Vinca minor*) - LOW
 Wisteria (*Wisteria floribunda/sinensis*) - LOW
 Cocklebur (*Xanthium strumarium*) - not rated by DCR

Other invasive plant species could become established on the installation in the future. Consultation of the Virginia Invasive Plant Species List (<https://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2023.pdf>) should occur periodically.

4.4. INVASIVE PLANT SPECIES THAT NEED TO BE MANAGED. The list above provides a comprehensive list of all of the invasive species present at JBLE-Eustis as of 1 January 2024. However, not all of these plant species interfere with installation activities and missions though all have varying degrees of negative impact on natural habitats. The species described below include those taxa that adversely impact activities or military missions or have the potential to disrupt these functions in the future if not controlled. These are the species that should be managed at JBLE-Eustis. Information on the identifying characteristics, habitat and range, impacts on ecosystems, origin and management provided in this section was taken from Kaufman and Kaufman (2007), and Miller (2003). Information is also provided on why the installation needs to manage these species. Priorities for control within a species should be defined based on areas where the species is aggressively spreading into new areas, areas where the species is abundant and displacing native species, and populations adjacent to sensitive or rare plant communities.

4.4.1. Common Reed (*Phragmites australis*).

4.4.1.1. Identifying Characteristics. Common reed is a tall, up to 20 feet, wetland grass with leaves sticking out from the stems similar to a corn plant. Leaves are 50 to 100 inches long and 0.4 to 1.75 inches wide. In summer, it produces fluffy plumes of flowers held above the stems. Distinguishing native and exotic *Phragmites* spp. can be challenging, but several differences can be seen in the field. Stems of the natives are generally more scattered, while exotic *Phragmites australis* forms dome-shaped, dense masses. Natives have more grey-green leaves while exotics have more yellow green leaves. Peel the leaf back from the stem, and the native will tend to

have smooth, shiny stems and a reddish color in spring and summer, whereas the exotic will have finely ribbed and dull stems with a tan color in spring and summer.

4.4.1.2. **Habitat and Range.** Common reed grows in wet areas such as marshes, floodplains, drainage ditches, lake edges, and dredge spoil areas. It tolerates brackish water. At JBLE-Eustis, common reed grows in large, monotypic stands in freshwater wetlands and in brackish wetlands where salinity is low enough. It also grows along the upper edge of brackish wetlands. One of the largest stands on the installation is in the JBLE-Eustis Dredge Material Management Area (FEDMMA) which constitutes the dredge spoil disposal facility. Common reed currently occupies over 450 acres of the installation and is likely spreading every year.

4.4.1.3. **Impacts to Ecosystem.** Common reed invasions begin in wet areas and stands become so aggressive and thick that they eventually shade out native aquatic and marsh plants. The dense stands are often too thick for wildlife. This plant does not provide value as a food source for wildlife. Wildlife diversity (particularly waterfowl and perching birds, muskrats, fish, and amphibians) decreases significantly once it becomes established.

4.4.1.4. **How it came to North America.** Archeological records show that common reed has been present on some sites for almost 3,000 years, but its rapid spread began after European colonization, and became even faster in the last century. It spreads mainly through the transport of root fragments from one wetland to another. It is unclear how this species was introduced to the installation.

4.4.1.5. **Why this species needs to be managed on the JBLE-Eustis.** Common reed represents the highest priority for invasive aquatic plants. It is currently the most widespread invasive species found on the installation and is likely having the greatest impact on native plant communities of any other invasive plant species. Its presence in these wetlands significantly reduces fauna biodiversity. Furthermore, this species poses as a significant wildfire hazard in certain areas of the installation. In some locations such as in Training Area 28, it hinders visibility along certain road networks. Of particular concern is that it could also pose as an impact on force protection especially near installation borders and shorelines because the dense stands could be used by trespassers and other unauthorized individuals. Priority is given to areas of common reed that are currently spreading and to the identification and eradication of new infestations. Given the large area currently occupied by the plant, regular monitoring is needed to establish which areas should be prioritized first for control. The plant occurs installation-wide adversely affecting training and non-training areas.

4.4.1.6. **Management.** Once an invasion takes root, extermination becomes very difficult. Small stands can be controlled through repeated cutting or by cutting and dripping glyphosate formulated for use near water into the cut stems in late summer. Controls for large stands include burning, flooding, disking, and aerial spraying of herbicides. In tidal areas where the elevation has been raised by the placement of dredge spoil or fill material, the areas can be excavated down to low marsh elevation and planted with smooth cordgrass (*Spartina alterniflora*). This lower elevation and frequent tidal inundation is usually sufficient to keep common reed out of the site. Control efforts using a imazapyr-based herbicide (i.e., Habitat®)

and glyphosate (Rodeo®) have been used. In some cases, this was executed in conjunction with prescription fires. Herbicide treatments alone will not eliminate common reed.

Management of this species via the follow techniques should be considered:

- Perform aerial and ground spraying preferably with imazapyr-based herbicide seasonally on all existing viable stands. This should occur at the end of the growing season usually in the October-November time frame and based on herbicide label specifications.
- Seek resources for the conversion of the marsh located across from Eustis Lake along Taylor Avenue between Harrison Road and Victory Blvd to a lower marsh with replanting of native aquatic vegetation.
- All construction sites or disturbed areas shall be managed by replanting with native vegetation.
- Manage the non-tidal wetland north of Felker Army Airfield (along Condon Road and Mulberry Island Road) as an emergent wetland. To accomplish this, a prescription fire should be performed following an aerial herbicide treatment. Follow-up routine monitoring with spot treatments will be performed. Replanting with native aquatic emergent vegetation would be implemented based on viability of the seed bank.
- Control common reed at the FEDMMA. Currently, the only means of controlling common reed at the FEDMMA is by annual aerial applications of herbicides augmented with ground treatments along the berm. However, this would be an expensive function. Prescription fires are not approved for this site. Keeping the FEDMMA weirs closed to retain water has potential to prevent or reduce regrowth if doing so is feasible. However, this could contribute to significant mosquito breeding. In such cases, aerial application of larvicides might be in order.
- Spot treat common reed that tends to arise within the artificially created emergent wetland along Harrison Road and Training Are 18. Harrison Road artificial wetlands were constructed to protect Harrison Road from erosion. Invasion by common reed would eliminate its added value as a recreational fishing and picnic area, mar aesthetics/obscure views of the James River and impact force protection.
- Use prescription fires in conjunction with herbicide applications.
- Perform routine monitoring of treated areas.

4.4.2. Japanese Stilt Grass (*Microstegium vimineum*).

4.4.2.1. Identifying characteristics. At maturity, the clumps of stilt grass have more stem than leaves. The slender stems rise to 3.5 feet, but often bend over. They bear lime green leaves with a distinct, off-center, shiny (minute silvery hairs) midrib. Alternate, well-spaced leaves are lance shaped, pointed fore and aft, 1 to 4 inches long and 0.5 inches wide. In late summer, thin flower

stalks appear at the leaf axils or ends of the stems. Flower heads consist of 1 to 3 thin spikes with flowers or seeds clustered along the spike, somewhat resembling crab-grass like heads. By late fall, after the plants have shed hundreds of yellow to reddish, elliptical seeds, their leaves darken and the plants die. Stilt grass resembles some other grasses, but can be easily distinguished by the silver stripe along the leaf and the leaf shape.

4.4.2.2. **Habitat and Range.** Stilt grass prefers soils that are acidic to neutral, and have high organic content, particularly floodplain forests and streambanks. It will also grow in fields, brushy areas, along roads, and under utility lines. It can also grow, however, in slightly alkaline soils and in fairly heavy shade. On JBLE-Eustis, this species grows the installation, and seems to prefer moist soils along streams and in non-tidal wetlands. This species is perhaps the most wide-spread invasive plant on the installation. It is abundant where there is man-made or natural disturbance. There is a fairly large infestation of this species along the road leading out to Landfill 15. It is likely to occur along the edges of roads in other areas of the base.

4.4.2.3. **Impacts to the Ecosystem.** By itself, stilt grass does not readily take over established natural plant communities, but given a start by some land disturbance (grazing, burning, mowing, or logging), it can quickly monopolize the ground level plant community within five years. Large patches of stilt grass, spreading by seeds, can outcompete native plants and rob the lower ones of sunlight. It will root at the stem nodes that touch the ground, but because it is an annual, only produces new plants by seed each year. Few animals browse stilt grass. Deer will not eat stilt grass, but unchecked populations of deer that reduce natural vegetation and cause soil disturbance can encourage the spread of the seed.

4.4.2.4. **How it came to North America.** The tradition of packing oriental porcelain in dry Japanese stilt grass (also called packing grass) probably accounts for its appearance in Tennessee around 1919 and elsewhere later on. It is unclear how and when this species was introduced to the base.

4.4.2.5. **Why this species needs to be managed on the JBLE-Eustis.** Japanese stilt grass should be a priority for control. While this species is currently very widespread and would be nearly impossible to eradicate from the installation, there are steps that can be taken to reduce its impact on native habitats. Control should be focused in areas where it is abundant, actively spreading and has become the dominant species. Because it is an annual, it is easily controlled with a glyphosate herbicide applied in September. It would also be beneficial to control this species along roadways. Because their small seeds are easily transported by water, the ditches along roadways act as pathways for the species to spread to new areas downstream. Occurs installation-wide.

4.4.2.6. **Management** The shallow-rooted grass is relatively easily pulled by hand when the ground is moist and the plants are tall enough to grab firmly at the base. This is impractical for large infestations. Large infestations require many hours of work and plants have to be pulled for several years to exhaust the seed bank. Mowing and weed whacking late in the season (September) before seeds set can also be useful as this will prevent seed buildup. However, mowing this species too early in the summer can give the plants time to produce new flower spikelets at the axils before winter. Systemic herbicides with glyphosate as a 2-percent solution

in water (8 ounces per 3-gallon mix) with a surfactant in late summer before seed set kills stilt grass but also its competitors. Herbicides containing imazameth will kill stilt grass but not most competing natives like asters, legumes, and sedges. Repeat treatments for several years to control abundant germinating seeds will be necessary to provide necessary control. Whenever there is soil disturbance, there should be monitoring of the area to identify any new infestations, as the seeds are easily transported on equipment.

4.4.3. Japanese honeysuckle (*Lonicera japonica*).

4.4.3.1. Identifying characteristics. The sweetly scented, tubular, white to pink flowers that fade to yellow make Japanese honeysuckle most recognizable in late spring. Flowering can continue throughout the summer and into fall. The twining vines ramble across the ground and over trees and shrubs. Most leaves are simple, oval and opposite. Leaves are 1.5 to 3.5 inches long. Some lowermost leaves are lobed like oak leaves. It spreads by seeds, underground rhizomes, and aboveground runners. The black fruit matures in fall. Leaves remain on the vines year-round. Japanese honeysuckle is easily distinguished from native vining honeysuckles by its black fruits (natives have red to orange fruits) and because the upper pairs of leaves is distinctly separate as opposed to the fused leaves of the native honeysuckle.

4.4.3.2. Habitat and Range. Japanese honeysuckle frequents road-sides, field and road edges, floodplains, and disturbed woods and forest openings. At JBLE-Eustis, Japanese honeysuckle is fairly widespread across the installation. It is most common along the edge of woods and roads and in open areas.

4.4.3.3. Impacts to the Ecosystem. Japanese honeysuckle overgrows small trees and shrubs and can girdle trees as vines thicken with age, killings hosts and eventually changing forest structure. It forms a dense ground cover in sunny areas, outcompeting native vegetation through above- and below-ground competition. Deer and rabbits eat the leaves, while birds eat the fruit. Because Japanese honeysuckle tends to form a monoculture, the variety of food and shelter available for animals decline. Japanese honeysuckle can persist for many years on the forest floor until a disturbance occurs (i.e., logging/blowdown), at which time the plant will suddenly grow very vigorously.

4.4.3.4. How it came to North America. Japanese honeysuckle first came to Long Island, New York in 1806 as an ornamental landscape vine. It spread throughout the country through the nursery trade. It was later promoted and planted for wildlife habitat and erosion control. It is still recommended for planting by some groups as wildlife food, particularly for winter forage for deer. It is unclear how or when this species was introduced to the base.

4.4.3.5. Why this species needs to be managed on the JBLE-Eustis. This species should be a priority for control. This species can have significant effects on native plants species, particularly smaller understory species. This species is very easy to visually identify in the winter when other species are dormant since it keeps its leaves throughout the winter in Virginia. Most other common vines (with the exception of English ivy) are deciduous and lose their leaves in the winter. Large honeysuckle vines should be identified for control in winter. Control should focus in areas of the installation where the species is abundant and displacing native species, and on large vines that are flowering and producing abundant fruit and seed for dispersal. This will

be primarily in open areas and along forest and road edges of the installation. Control should focus on treatment of large infestations in open areas with herbicide and on the cutting and herbicide treatment of honeysuckle vines that are climbing into the canopy to reach sunlight. The control of these honeysuckle vines will also benefit the host tree, as the climbing vine can girdle and kill the host tree. Reducing the abundance of flowering and fruiting vines will help reduce the spread and abundance of this species on the base. Because this species is evergreen in Virginia, treatment with herbicides can be performed in the fall/winter when desirable native species are dormant. Occurs installation-wide adversely affecting training and non-training areas.

4.4.3.6. Management. In loose soil, plants can be pulled up by hand, but root fragments will resprout. Because Japanese honeysuckle holds its leaves throughout the year in Virginia, it can be sprayed with herbicide, such as glyphosate as a 2-percent solution (8 ounces per 3-gallon mix), after most other plants are dormant. The use of Garlon 3A or Garlon 4 as a 3- to 5-percent solution is also effective. Retreatment may be necessary as plants often resprout after initial spraying. In mature forests, honeysuckle can be significantly reduced by cutting vines off of trees to prevent them from climbing to the light necessary for stronger photosynthesis. For large vines, cutting and immediately treating the freshly cut stems with a glyphosate herbicide or Garlon 3A as a 20-percent solution (2.5 quarts per 3-gallon sprayer) in water with a surfactant is also effective. Prescribed burning in spring will reduce dense ground mats and sever climbing vines for more effective herbicide treatments to re-sprouting vines.

4.4.4. Tree of Heaven (*Ailanthus altissima*).

4.4.4.1. Identifying characteristics. This fast-growing deciduous tree attains a height of 80 feet or more. The 11 to 41 leaflets on a straight stem are actually part of a single 1 to 4 foot long compound leaf that appears very late in the spring. Each leaflet is lance shaped with a long pointed tip and has just 1 to 5 teeth at the base of the leaflet. Crushed foliage has an unpleasant odor often described as burnt peanut butter. The leaves are alternately arranged. The stout twigs are covered with fine hairs when young and have a yellowish pith. On older trees the bark is relatively smooth and either light brown or striped gray-brown. In early summer, trees produce yellowish flowers held in a large cluster above the leaves at the ends of the branches. Male and female are on separate trees. A single large female tree can produce more than 300,000 papery-winged, wind-dispersed, tan seeds in late summer to fall.

4.4.4.2. Habitat and Range. Tree of heaven tolerates a wide range of soils, from coastal sandy soils to rocky mountain soils, but it is not very shade tolerant. It thrives in disturbed areas and tolerates air pollution and acidic soils. It can be found along road embankments, field edges, urban pavement cracks, railroad beds, mine spoils, and in disturbed forests. At JBLE-Eustis, tree of heaven can be found along forest edges, particularly along roadways. It is most common on Mulberry Island. Large stands existed in Training Areas 23, 24, and 28; however, considerable efforts have removed most these stands.

4.4.4.3. Impacts on the Ecosystem. Once established, tree of heaven sends up many root sprouts, rapidly forming a dense colony. Chemicals released from the roots and from leaf litter hinder the growth of other plants. The aggressive root system can damage sewer pipes and foundations. These colonies will quickly inhibit the growth and establishment of native species.

4.4.4.4. How it came to North America. Tree of heaven is native to China where it was called tree of heaven because it grew out of the rocks on mountains where other trees would not grow. Tree of heaven first reached Philadelphia in 1748, introduced by a gardener. Nurseries, particularly on the east coast, sold tree of heaven because it was pest free, grew quickly, and was easy to grow in any soil. Chinese immigrants brought seeds to the west coast in the 1850s during the Gold Rush, probably because of traditional medicinal uses. It is unclear how this species was introduced to the base.

4.4.4.5. Why this species needs to be managed on JBLE-Eustis. Tree of heaven remains as high priority species for the control at JBLE-Eustis because it is now being brought under control. Control was effected by survey work followed by aggressive treatment efforts over a period of several years. Consequently, continued monitoring and surveillance is needed to avoid extensive expenditure of resources should it spread again. Reestablishment and extensive spread will have significant consequences. While this species appears to be widespread across the base, it does not appear to be incredibly abundant, however this is expected to change given sufficient time without any control measures. This species is a high priority for control for two primary reasons: (1) because of its ability to spread quickly and colonize new areas, thus having a significant impact on native plant communities and military missions especially training by creating impenetrable stands restricting unit/personnel movement during small tactics, bivouac and other training activities movement, and (2) it serves as a primary host plant for the invasive spotted lanternfly. It is most common along forest edges and in forest openings. Because this species produces abundant seed (one tree can produce up to 300,000 seeds per year), initially, priority should be focused on the identification of infested areas and the elimination of trees that are producing seed, particularly older trees. This will help slow the spread of this species. Once prevented from producing seed, control should focus on smaller trees that surround these larger trees. With persistence, this species can be managed effectively. Occurs installation-wide but has a major impact on training areas.

4.4.4.6. Management. Cutting trees only encourages a huge number of root sprouts, in addition to the resprouting at the trunk. Small trees can be pulled by hand or with a weed wrench, but fragments of root can result in more root sprouts. The “hack and squirt” method works well for larger trees, notching the trunks with an axe and squirting a systemic herbicide into the cut or cutting trees and applying herbicide to the cut stump in summer using Garlon 3A, Pathfinder, or Arsenal AC in dilutions specified on the label. On saplings, applying Garlon 4 as a 20-percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to young bark as a basal spray in late winter/early spring is also effective. Spraying the foliage of the trees in summer with Arsenal AC as a 1-percent solution (4-ounces per 3-gallon mix), Krenite S as a 30-percent solution (3 quarts per 3-gallon mix), or Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix) and a surfactant is also effective.

4.4.5. Kudzu (*Pueraria montana*).

4.4.5.1. Identifying characteristics. This fast-growing deciduous vine scrambles over trees, buildings, and power lines. Kudzu leaves are made up of three leaflets, each of which can be unlobed or have 2 to 3 lobes with the leaflet up to four inches wide. Leaves have hairy margins and grow alternately along the stem. Individual flowers, about 0.5 inches long are purple, highly fragrant, and born in long hanging clusters in midsummer. Brown, hairy flat seed pods follow quickly with 2 to 10 hard seeds. Kudzu has massive taproots up to 6 feet in length.

4.4.5.2. Habitat and Range. Kudzu adapts to a variety of soils, but thrives in areas with mild winters and hot, humid summers with annual average rainfall above 40 inches. At JBLE-Eustis, kudzu appears to be fairly localized in distribution and is not widespread. However, the potential for this species to spread is high.

4.4.5.3. Impacts to the Ecosystem. Kudzu's massive area of leaves collects nitrogen and sunlight from the air. It is almost entirely an open field and forest edge invader, but it now affects up to 7 million acres of land by some estimates. While frost kills most of the vines each fall, shoots resprout every spring from the roots and vines can grow up to 1 foot a day and send out anchor roots as they grow. In the 6-month frostless periods in the summer, one root can send out 30 vines and a vine can grow over 100 feet and grow over the tops of trees and power lines. Roots can penetrate 10 feet into the ground and weigh over 100 pounds. Few kudzu seeds are viable and those that are may take several years to germinate, so kudzu spreads mostly vegetatively.

4.4.5.4. How it came to North America. The Japanese government's garden of native plants at the 1876 Centennial Exposition in Philadelphia, Pennsylvania, included kudzu. Americans began using it in the Southeast to shade porches with its broad leaves and sweet-smelling blossoms. In the 1920s, one Chipley, Florida, nursery sold kudzu through the mail to be planted for forage. In the 1930s, as small farmers in the South abandoned unprofitable red clay soils, government work crews planted thousands of acres of kudzu for erosion control. In the 1940s, the government helped spread kudzu by paying farmers \$8 an acre to plant kudzu in old fields. The U.S. Department of Agriculture removed kudzu from its list of approved cover crops in 1953. It is unclear how this species was introduced to the installation.

4.4.5.5. Why this species needs to be managed on JBLE-Eustis. Kudzu remains as high priority species for the control at JBLE-Eustis because it is now under control. Control was effected by routine monitoring and aggressive treatment efforts over a period of several years. Consequently, continued monitoring and surveillance is needed to avoid extensive expenditure of resources should it return. Reestablishment and extensive spread will have significant consequences. Establishment in training areas create huge stands greatly limiting visibility and movement during training activities. Additionally, growth will overwhelm trees creating hazards when the tree is weakened or dies. This remains an additional concern for training areas but also exists as such in non-training areas. Furthermore, expansive growth mars aesthetics throughout the year. Based on existing information as to its infestation and subsequent monitoring and treatments from 2008 through 2020, near eradication from the installation has been achieved.

4.4.5.6. Management. The key to control now remains as surveillance. However, should new control be needed, root destruction is the key technique to execute. Monthly close to the ground mowing for at least two years to deplete carbohydrate storage can eliminate some stands. Systemic herbicides such as Garlon 4 or a glyphosate herbicide as a 2-percent solution in water (8 ounces per 3-gallon mix) with a surfactant can be applied late in the season to cut vine stumps and any resprouts. Applying Garlon 4 as a 20-percent solution in commercially available basal oil, diesel fuel or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to large vines as a basal spray in the spring (January to April) will control vines less than 2 inches in diameter. A small stand existed in Training Area 2 and an estimated 11 acres existed north and south of the second access gate/along Warwick River. The stand in Training Area 2 was originally treated in 2008 and subsequently monitored with limited follow-up treatments in 2017, 2019 and 2019. This stand appears to be eradicated as of 2023. The stand near the second access gate was treated in September-October 2011. Follow-up monitoring and spot treatments were performed in 2012-2020. As of 2023, most of the kudzu has been eliminated; however, continued monitoring particularly the area east of the elementary school is needed.

4.4.6. Chinese lespedeza (*Lespedeza cuneata*).

4.4.6.1. Identifying characteristics. This perennial legume forms a bushy clump from 1 to 5.5 feet tall with as many as 20 stems. Each stem is covered with leaves divided into 3 leaflets. Leaves are arranged alternately along the stem. Chinese lespedeza can be distinguished from all other lespedezas by the wedge-shaped base of the leaflets. Leaflets are only 0.5 to 1 inch long and are covered by dense hairs giving them a gray-green appearance. Chinese lespedeza flowers from midsummer to fall, with two flower types. The showier flowers are small creamy white flowers with purple throats nestled in clusters of 2 to 4 among the leaves along the upper parts of the branches. These flowers are insect pollinated. The other flowers do not have petals and are self-pollinated. They are mixed in with the insect pollinated flowers. Bicolor lespedeza and Thunberg's bushclover are woodier and larger than Chinese lespedeza and the flowers are arranged in an elongated cluster.

4.4.6.2. Habitat and Range. Chinese lespedeza grows in meadows and prairies, along roadsides and in pastures. It tolerates poor soil conditions and prefers sunny sites. Stands can be damaged by late spring freezes. At JBLE-Eustis, this plant is widespread, however, it is most abundant in open areas that are infrequently mowed. This species is particularly abundant on the capped landfills (Landfills 7 and 15) that are infrequently mowed. This species does persist in wooded areas and along forest edges but is not dominant or aggressive under these lower light conditions.

4.4.6.3. Impacts to the Ecosystem. Plants develop into large stands through spreading root systems. A single plant can persist for more than 20 years. Because it spreads vigorously, it displaces native plants and hinders their colonization. Given time, this species can come to completely dominate open areas if left unchecked. It is competitive during droughts because a deep taproot allows it to persist. The tannins and other chemicals inhibit the growth of other plants and make older lespedeza plants unpalatable to grazers. In meadows, it does provide cover for ground nesting birds. Bobwhite quail will eat the seeds, however, very few other bird species consume the seeds.

4.4.6.4. How it came to North America. Native to Asia and Australia, Chinese lespedeza was brought first to Arlington, Virginia, in 1899. It spread to the southeastern United States, planted as forage for livestock and for erosion control. Wildlife managers often recommended it for meadow plantings to encourage quail. It is still widely planted for quail despite its listing as an invasive species in many states. It is unclear how this species was introduced to the base.

4.4.6.5. Why this species needs to be managed on JBLE-Eustis. In open areas of the base, this species has the potential to form a monoculture. When first identified on a site, it only takes a couple of years for this species to become dominant and outcompete nearly all other species. The presence of this species significantly impacts native plant communities. The presence of this species in training areas could significantly interfere with military training since once established this species forms thick mats that are difficult to walk through. This species is also a prolific seed producer, which allows the species to spread very quickly in open areas.

4.4.6.6. Management. Because of the extensive root system and that seeds remain viable in the soil for many years, eradicating Chinese lespedeza takes persistence. Hand pulling is ineffective because of the extensive root system. Mowing just before plants begin to flower for several years in a row can reduce the vigor of plants and keep them from spreading. Applying Garlon 4 to the leaves as a 2-percent solution (8 ounces per 3-gallon mix) during mid to late summer can be very effective. Mowing 1 to 3 months before herbicide applications can assist with control. A glyphosate herbicide as a 2-percent solution (8 ounces per 3-gallon mix) can also be used, however, impacts to non-target species will be greater than with Garlon 4. Transline applied as a 0.2-percent solution (1 ounce per 3-gallon mix) can be used to reduce impacts to non-target plant species.

4.4.7. Johnson grass (*Sorghum halepense*).

4.4.7.1. Identifying characteristics. Mature Johnson grass grabs the soil with half inch thick roots, grows to 8 feet tall, and reproduces by rhizomes and copious seed. Rhizomes are white to pinkish when young, beige when mature, and have frequent nodes. Leaf blades are flat with a white rib, up to 2 feet long and 1 inch wide with rough but not toothed margins, bright green, sometimes with purple shoots. The seed heads are purplish and hairy, can be 2 feet long, beginning compact then opening with pairs or trios of spikes at the node of the panicle, one of each pair being non-seed bearing. Rhizomes distinguish it from corn. The white leaf vein distinguishes it from eastern gamma grass and switchgrass. Big bluestem and Indian grass have narrower leaves and usually no distinct midvein.

4.4.7.2. Habitat and Range. This Mediterranean native prefers habitat in old fields, croplands, pastures, forest edges, power line clearings, fertile bottomlands, and streambanks. Agronomists consider it one of the worst weeds in the world with 53 countries reporting it as a major problem. At Johnson Eustis, Johnson grass invades open fields that are infrequently mowed, particularly after having been disturbed. This species is particularly abundant on the capped landfills (Landfills 7 and 15) that are infrequently mowed. Control challenges have existed at the B2015 compound, peripheral areas of the golf course, and the Matthew Jones House plantation as other examples.

4.4.7.3. Impacts to the Ecosystem. Johnson grass plants can produce over 80,000 seeds in one season and 200 feet of rhizomes. The seed remains viable for over 20 years. Johnson grass on untended land often forms pure stands that outcompete native grasses for space, water, and nutrients, thus reducing both animal and plant diversity. Because of the large amount of biomass it produces, it becomes a fire hazard during dry periods.

4.4.7.4. How it came to North America. By the mid-1800s, botanists had identified Johnson grass in North America using 8 different botanical names and dozens of common names. In 1874 an Alabama botanist called it Johnson grass because it had been grown for 40 years on the farm of Colonel Johnson. The grass had previously been called Means grass because Gov. John Means of South Carolina had imported it from Turkey as “guinea grass” and he and his brother William both grew it. The grass apparently overran William’s farm and he moved to Louisiana. The governor said he could not move because “the big grass has inspired such a terror that no one will even look at (my place).” Johnson grass has since spread in contaminated feed and seed shipments. It is unclear how this species was introduced to the base.

4.4.7.5. Why this species needs to be managed on JBLE-Eustis. In open areas of the installation, this species has the potential to form a monoculture. When first identified on a site, it only takes a few years for this species to become dominant and outcompete nearly all other species. The presence of this species significantly impacts native plant communities. The presence of this species in training areas could significantly interfere with military training since once established this species forms thick tall stands that are difficult to walk through. This species is also a prolific seed producer, which allows the species to spread very quickly in open areas. Additionally, stands may serve as harborage for ticks.

4.4.7.6. Management. The key is to prevent seeding and deny nutrients to the roots. Cultivating fields colonized by Johnson grass often spreads the invasion by chopping the rhizomes into pieces and replanting them. Tilling or plowing in late fall exposes roots to freezing and can be followed by herbicides in the spring. For a limited area, hand pulling should be done only when the ground is wet and soft so that roots do not break and resprout. Application of a glyphosate herbicide as a 2-percent solution (8 ounces per 3 gallon mix) to the foliage during the summer before seed set can be effective, however, only if continued for 3-4 years.

4.4.8. English Ivy (*Hedera helix*).

4.4.8.1. Identifying characteristics. This evergreen climbing vine has dark waxy leaves placed alternately along the stem. Leaves can take several forms but are generally 3-lobed with a heart-shaped base. Plants can remain immature indefinitely, but sunlight triggers maturity such as when vines climb into trees. Mature plants branch out and have unlobed, rhomboid-shaped leaves. Sunlight triggers the flowering of clusters of small, greenish-white flowers that in late summer form blackish fleshy fruits around one to several stone like seeds. Ivy spreads by runners and by bird-dispersed seeds.

4.4.8.2. Habitat and Range. Native to Europe, western Asia, and northern Africa, English ivy prefers shady or semi-shady, moist areas but is drought tolerant. It thrives in disturbed forests.

At JBLE-Eustis, this species is not widespread. However, given time and left unchecked, this species has the potential to become a larger problem at the base.

4.4.8.3. Impacts to the Ecosystem. English ivy grows along the ground and climbs on any plant or object in its path. The dense blanket blocks light and germination of other plants beneath it, reducing local plant diversity. It will grow several stories up the sides of buildings or into the canopy of a forest, adding weight to the trees. This added weight can make them more susceptible to blowdown, particularly in this area where tropical storms and hurricanes are common. Covering tree trunks, ivy can loosen bark and hold moisture against the tree trunk, encouraging fungus and decay. Few birds will eat the berries as they are considered mildly toxic.

4.4.8.4. How it came to North America. European colonists introduced English ivy early in their settlement of North America, mainly as a decorative plant. The earliest record of English ivy in North America is from 1727. In cultivation, it is fast growing and requires little maintenance. It is unclear how this species was introduced to the base, although it may exist from old home sites.

4.4.8.5. Why this species needs to be managed on JBLE-Eustis. This species is currently spreading across the installation. It can eventually kill or impact tree health. It occurs installation-wide and may eventually kill trees that become hazards in training and non-training areas.

4.4.8.6. Management. It is more cost effective to control this species while relatively limited in distribution. Initial control efforts should focus on cutting vines that are growing up trees, as these are the portions of the vines that flower and produce prolific seed for dispersal. This should immediately be followed with herbicide treatment of the cut stump. Vines can be pulled up by hand or dug up. Vines on the ground can also be smothered by covering them with plastic or a thick layer of newspaper and mulch during the summer. Climbing vines can be contained by cutting stems near the ground, but do not attempt to remove from high branches. Since ivy can reproduce from cuttings or vines in contact with the soil, do not leave cut vines on the ground. Application of either Garlon 3A or Garlon 4 to leaves with a surfactant in late summer to early fall (July to October) as a 3- to 5-percent solution (12 to 20 ounces per 3-gallon mix) can be effective. Application of a glyphosate herbicide as a 2-percent solution (8-ounces per 3-gallon mix) is also effective. Use of a string trimmer to reduce growth layers and injure leaves to improve herbicide uptake will enhance effectiveness. These herbicides can also be applied to the cut stems. Applying Garlon 4 as a 20-percent solution in commercially available basal oil, diesel fuel or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to large vines as a basal spray can be effective, however, care should be taken to avoid spraying the bark of the host tree.

4.4.9. Chinese privet (*Ligustrum sinense*).

4.4.9.1. Identifying characteristics. While several species of privet may occur on the installation, the most common species in the area is Chinese privet. Chinese privet is an evergreen shrub that grows up to 15 feet tall. The glossy, leathery leaves are arranged opposite along the stem and are ovate to elliptic with rounded tips. Leaves are 0.8 to 1.6 inches long and

0.4 to 1.2 inches wide. In early summer, small plumes of tiny white flowers with a fused base breaking up into 4 petals appear at the ends of the twigs. By fall, clusters of dark blue-black berries have matured. Because this species is evergreen, and has small leaves, it is fairly easily to identify along roads and forest edges in the winter when other species are dormant.

4.4.9.2. *Habitat and Range.* Chinese privet grows along woodland edges, in floodplains, old fields, riparian forests, and upland forests. Privet is tolerant of some shade and of occasional drought. In shade, privet will readily sprout and grow but will not flower until a disturbance opens up the canopy. At JBLE-Eustis, Chinese privet is widespread, growing along forest edges and open areas. Because of its fast growth, privet will quickly outcompete native plants in open areas and forest edges.

4.4.9.3. *Impacts on the Ecosystem.* Privet forms dense stands that outcompete native plants for space, light, and water. Few insects feed on it because chemicals in the leaves inhibit digestion. Deer will feed on privet. Birds will eat the fruit and disperse the seeds to forest gaps and into fields. The ingestion by birds is the main form of dispersal and has allowed this species to quickly colonize new areas.

4.4.9.4. *How it came to North America.* Chinese privet was introduced into the United States in 1952 for use in gardens. Other privet species were introduced much earlier. It quickly spread from gardens into natural areas by birds who ingest the fruit. It is unclear how this species was introduced to the base.

4.4.9.5. *Why this species needs to be managed on JBLE-Eustis.* This species can become very abundant in open areas and along forest and road edges and can have negative effects on native plant communities. This species could also interfere with military training if large infestations were established. Initial control efforts should focus on the identification and removal of large shrubs that are producing abundant flowers and fruit for dispersal. This initial control effort should reduce the spread of this species. Priority should also be given to areas with large numbers of plants, as these can interfere with the growth of native plant communities. Occurs installation-wide and is a significant issue in training areas.

4.4.9.6. *Management.* Young plants can be hand pulled or pulled with the aid of an uprooting tool like a weed wrench or mattock. Shrubs can also be cut multiple times until they die. To control with herbicides, thoroughly wet all leaves with a glyphosate herbicide as a 3-percent solution (12 ounces per 3-gallon mix) or Arsenal AC as a 1-percent solution (4 ounces per 3-gallon mix) with a surfactant in late summer to early winter (August to December). For large plants, cut stems should immediately be treated with Garlon 3A or a glyphosate herbicide as a 20-percent solution in water (2.5 quarts per 3-gallon mix) with a surfactant. Large plants can also be treated with Garlon 4 as a 20-percent solution in a commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant to young bark as a basal spray. Additionally, some success was observed using Pathfinder II herbicide that has the active ingredient Triclopyr Butoxyethylester (13.6 %). This should be used for woody vegetation with less than 6 inches basal diameter.

4.4.10. Thorny olive (*Elaeagnus pungens*).

4.4.10.1. Identifying characteristics. Thorny olive tends to grow as a dense shrub with long shoots coming out of the top while the other two tend to grow as small trees to 30 feet. Leaves on the thorny olive are alternate, oval to elliptic and thick, 0.4 to 4 inches long and 0.2 to 2 inches wide. Blade surfaces are silver and scaly in spring becoming dark green or brownish green above and densely silver and scaly with scattered brown scales beneath. Numerous silvery white flowers in clusters are produced in the fall that are tubular with four lobes. Red juicy fruits that are 0.3 to 0.6 inches are produced in late fall. Because this species is evergreen, and has distinguishing leaf color and growth form, it is fairly easily to identify along roads and forest edges in the winter when other species are dormant.

4.4.10.2. Habitat and Range. This species is usually found as scattered plants in forest openings, open forests, and along forest edges. This species thrives in sandy floodplains but is intolerant of shade. At JBLE-Eustis, this species is widespread along forest edges and in open areas or young forests. There are some parts of the installation where this species is relatively abundant.

4.4.10.3. Impacts to the Ecosystem. The roots of thorny olive form an association with bacteria to fix nitrogen, which may change the composition of the plant community. Shrubs can grow so densely that they outcompete other species. This species does provide both cover and winter food for wildlife, however the diversity of plants is reduced where this species is abundant.

4.4.10.4. How it came to North America. This species was introduced as an ornamental from China and Japan in 1830. This species was frequently planted for hedgerows and on highway right-of-ways and is still used for landscaping. Wildlife managers extensively promoted the use of this species as cover and food for wildlife and agricultural extension agents promoted their use to farmers as fast-growing windbreaks. It is unclear how this species was introduced to the base.

4.4.10.5. Why this species needs to be managed on JBLE-Eustis. This species can become abundant in open areas and along forest and road edges and can have negative effects on native plant communities. This species could also interfere with military training if large infestations were established.

4.4.10.6. Management. Initial control efforts should focus on the identification and removal of large shrubs that are producing abundant flowers and fruit for dispersal. This initial control effort should reduce the spread of this species. Priority should also be given to areas with large numbers of plants, as these can interfere with the growth of native plant communities. Young seedlings can be pulled by hand, especially when the soil is moist. To control with herbicides, the leaves of seedlings and small saplings should be thoroughly wetted with Arsenal AC or Vanquish as a 1-percent solution in water (4 ounces per 3-gallon mix) with a surfactant between April and October. To control larger plants, apply Arsenal AC as a 10-percent solution (1 quart per 3-gallon mix) or a glyphosate herbicide as a 20-percent solution (2.5 quarts per 3-gallon mix) to stumps immediately after cutting. This treatment is most effective in late summer. Large plants can also be treated with Garlon 4 as a 20-percent solution in a commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to young bark as a basal spray (January to February or May to October).

This may not be the only *Elaeagnus* sp. found on the installation, however this is likely the most common. Autumn olive (*E. umbellata*) and Russian olive (*E. angustifolia*) are also reportedly present on the base (Versar, 2006).

4.4.11. Autumn olive (*Elaeagnus umbellata*).

4.4.11.1. Identifying characteristics. Autumn olive is a multi-stemmed, woody shrub growing up to 20 feet in height. Leaves are simple and ovate with a smooth/entire margin and are approximately 3 inches long with silver on the underside and alternate down the stem. Older stems are grey to brown may appear furrowed. Newer stem growth is brown with silvery scales and white lenticels on younger stems. Pale yellow to white flowers occur in clusters of four to six in the spring developing into red drupes with silver flecks by late summer. Root systems are particularly deep.

4.4.11.2. Habitat and Range. Autumn olive grows in disturbed areas including roadsides, open fields and adjacent to streams and forest edges typically where full sunlight is available. It spreads by root suckers and via birds which readily feed on the fruit. It occurs installation wide.

4.4.11.3. Impacts to the Ecosystem. This species creates dense foliage inhibiting native plant growth and outcompeting native vegetation because it alters the soil chemistry creating unfavorable conditions for native plants.

4.4.11.4. How it came to North America. It was intentionally introduced into the U.S. during the 1830s primarily as an ornamental shrub. However, it was also planted extensively for soil stabilization, mining reclamation, and as a source of food for wildlife.

4.4.11.5. Why this species needs to be managed on JBLE-Eustis. This plant can impact natural habits at JBLE-Eustis as well as impacting military training by creating dense, impenetrable stand that restrict movement as with several other invasive plants noted above.

4.4.11.6. Management. Mechanical techniques are limited due to deep root systems precluding hand-pulling while heavy machinery could be used to remove large plants. Prescribed fires are not effective against autumn olive. Foliar herbicide applications are feasible. On plants less than 6 feet tall, apply 2% to 4% v/v glyphosate in water or 1% to 2% v/v triclopyr in water. Basal bark techniques can be used on plants 6 inches in diameter or less by applying a triclopyr ester formulation at a 20% to 30% v/v rate, mixed with basal oil, to the lowest 15 inches of the stem. Additionally, cut stump technique can be used by applying glyphosate at a 25% to 50% v/v rate in water or triclopyr amine in water or ester in oil at a 20% to 25% v/v rate within 10 minutes of cutting.

4.4.11. Princess tree (*Paulownia tomentosa*).

4.4.11.1. Identifying characteristics. This tree can be recognized by its large, heart-shaped, velvety leaves and the pale, violet spring flowers that blossom in 8 to 12 inch long, upright clusters. Flowers are 1.5 to 2 inches long and tubelike. Leaves are in opposite pairs on the stems and 5 to 12 inches long. Flowers produce a 4-segment capsule that shelters thousands of small,

winged seeds. Capsules stay attached during the winter and smaller rounded flower buds are also visible in winter. New branches and stems are greenish to brown, flattened where stems and branches join. Bark is thin with shallow creases. Second-year branches are pithy to hollow inside. Trees grow very rapidly, reaching 50 feet tall and 2 feet in diameter. This species is very easy to visually identify in the spring with its showy pale-violet flower clusters and in the winter with its large branches and terminal nut-like clusters. It is most common along forest edges and in forest openings.

4.4.11.2. Habitat and Range. Because of its copious seed production and ability to spread seed by wind, Princess tree quickly colonizes sites following disturbance (clearcuts, burns, and storm blowdowns). Princess tree will also grow along forest edges and open areas where sunlight is sufficient. At JBLE-Eustis, the species is widespread but not abundant, but because of its prolific seed production has the potential to become more abundant and widespread. The species seems to grow along the edge of woods and roads where there is sufficient sunlight.

4.4.11.3. Impacts to the Ecosystem. Princess tree can grow more than 15 feet a year and send up new shoots from root sprouts. A single tree can produce up to 20 million seed a year that are easily spread by wind and water. The seeds germinate and grow quickly. Because of their fast growth and prolific seed production, this species can quickly outcompete native species for light and moisture.

4.4.11.4. How it came to North America. The Dutch East India Company brought princess tree to Europe in the 1830s from its native China and Japan. It was brought to North America shortly thereafter. It has been widely planted in North America as an ornamental and grown in scattered plantations for speculative high value wood exports to Japan. It is also sold in the nursery trade as an extremely fast-growing shade tree. It is unclear how this species was introduced to the installation.

4.4.11.5. Why this species needs to be managed at JBLE-Eustis. While this species appears to be widespread across the installation, it does not appear to be incredibly abundant. This situation could change given sufficient time without any control measures. Because this species produces abundant seed (up to 20 million per year) and is very fast growing, this species should be a priority for the base to manage.

4.4.11.6. Management. Initially, priority should be focused on the identification of infested areas and the elimination of trees that are producing seed, particularly older trees. This will help slow the spread of this species. Once these large seed trees are eliminated, management should focus on the smaller trees. Hand pulling of young plants should be done when soil is wet so the entire root system can be removed. Trees can be cut or mowed and then repeatedly mowed until the tree dies. To control with herbicides, the leaves of small trees can be sprayed with Arsenal AC as a 1-percent solution (4 ounces per 3-gallon mix) or with a glyphosate herbicide, Garlon 3A or Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix) in late summer (July to October). Arsenal AC or a glyphosate herbicide can also be applied to stumps immediately after cutting anytime except March and April. This can also be applied as stem injections. Apply at concentrations as specified on the label.

4.4.12. Mimosa tree (*Albizia julibrissin*).

4.4.12.1. Identifying characteristics. Mimosas are small trees that grow 20 to 40 feet tall. They are often multi-stemmed with vase-shaped branching. The bark is smooth and tan colored. Trees leaf out late in spring. Their feathery double compound leaves are arranged alternately along the stem, and each leaf is about 20 inches long. Most distinct are the fragrant, pink, powder-puff looking flowers at the ends of the branches that bloom in early summer and are 1.5 inches across. Clusters of tan to brown 6-inch-long flat pods form in late summer each containing several oval, flattened seeds. This species is very easy to visually identify in the spring with its pink powder-puff looking flowers.

4.4.12.2. Habitat and Range. Mimosa grows in open areas, forest edges and river floodplains in a wide range of soil types. It is also tolerant of drought, wind and salt spray. At JBLE-Eustis, this species is widespread but not particularly abundant. However, because of its ability to produce prolific seed, there is high potential for this species to spread. It occurs mostly along forest edges along roads. This species prefers open sunny conditions but will persist in shade. It is most common along forest edges and in forest openings.

4.4.12.3. Impacts on the Ecosystem. Because of its prolific seed production, mimosa can produce dense stands that can reduce light and water available to native plants. Trees fix nitrogen and their leaf litter is high in nitrogen resulting in higher soil nitrogen levels, potentially changing the plant community. The flowers from this species do provide nectar for hummingbirds and many insects.

4.4.12.4. How it came to North America. Mimosa was introduced from Asia in the late 1700s to Charleston, South Carolina. Thomas Jefferson brought this species to Virginia in the late 1700s to grow at Monticello. It was widely introduced as an ornamental plant around the same time because of its unusual, attractive and fragrant flowers and interesting fern-like foliage. It is unclear how this species was introduced to the installation.

4.4.12.5. Why this species needs to be managed on JBLE-Eustis. While this species appears to be widespread across the base, it does not appear to be incredibly abundant. This situation could change given sufficient time without any control measures. Because this species produces abundant seed that is viable for many years and is fast growing, this species should be a priority for control.

4.4.12.6. Management. Initially, priority should be focused on the identification of infested areas and the elimination of trees that are producing seed, particularly older trees. This will help slow the spread of this species. Once these large seed trees are eliminated, management should focus on the smaller trees. Seedlings can be hand pulled. Trees resprout readily after being cut, and they sucker from roots. Seeds can remain viable for up to 50 years. Trees can be cut while flowering to eliminate seed production, but resprouts will have to be cut or stumps treated with herbicide. For large trees, mimosa can be controlled with stem injections of Arsenal AC or Garlon 3A in dilutions as specified on the label (anytime except March and April). For felled trees, these herbicides should be applied to the stem and cut stump immediately after cutting. For smaller trees, the application of Garlon 4 as a 20-percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to young bark as

a basal spray can be effective. For stump resprouts and seedlings, thoroughly wet all leaves with either Garlon 3A, Garlon 4, or a glyphosate herbicide between July and October as a 2-percent solution (8 ounces per 3-gallon mix) or with Transline between July and September as a 0.2 to 0.4 percent solution (1 to 2 ounces per 3-gallon mix).

4.4.13. Golden bamboo (*Phyllostachys aurea*).

4.4.14. Identifying characteristics. Golden bamboo grows in dense evergreen thickets with hollow stems up to 30 feet high and 1 to 6 inches in diameter. Golden bamboo is distinguished by its inflated and often contorted internodes near the base of the stem. The green-gold stems and twigs bear leaves 0.25 to 0.75 inches wide and 3 to 10 inches long, generally growing alternate or in fanlike clusters pointing upward. The plant spreads by shallow underground stems (rhizomes) that send up new stems from alternate nodes. This particular species of bamboo may flower only once in 7 to 12 years.

4.4.15. Habitat and Range. Golden bamboo prefers open sunlight and warm climates, though it tolerates winter temperatures to 0°F (-18°C). It also grows in partially wooded areas. The optimum soils are light and moist or southeastern clays that hold moisture. This plant was once widespread across the installation with stands at various locations including the golf course, Browns Lake area, Third Port, two areas adjacent to the Thompson Circle housing area, Training Area 28, and along portions of Harrison Road. It has been eliminated from several of these areas with the Thompson Circle stands still under management. The plant has encroached into the Dog Park located adjacent to the south area of Thompson Circle.

4.4.16. Impact on the Ecosystem. In open areas and disturbed areas, golden bamboo spreads very rapidly by rhizomes. Because of the density, height and spreading leaves of bamboo stands, they effectively eliminate native vegetation by the dense shade they cast.

4.4.17. How it came to North America. Several hundred bamboo species have been brought to North America for ornamental planting, with 24 of these being in the *Phyllostachys* group. Bamboo was also widely planted for fishing poles. Golden bamboo, the most invasive, was introduced in Alabama in 1882 from Asia. It is unclear how the species was introduced to the base.

4.4.18. Why this species needs to be managed on JBLE-Eustis. This species remains a high priority because of the successful control efforts have eliminated most of the stands from the installation. This species can become abundant in open areas and along forest edges and can have negative effects on native plant communities. This species could also interfere with military training if large infestations were established. These stands can also serve as mosquito breeding sites.

4.4.19. Management. The installation should continue to remove the remaining stands and then continue to monitor the treatment sites and continue to monitor installation-wide for future establishment. Small stands can be controlled and contained by mowing repeatedly to kill shoots sent up by rhizomes. For larger stands, most bamboos are easily controlled by combining cutting to the ground in June with a fall application of herbicides to any regrowth, and a repeat

application two weeks later. Concentrated solutions applied to stems immediately after cutting will also prevent most regrowth. Arsenal AC as a 1-percent solution (4 ounces per 3-gallon mix), a glyphosate herbicide as a 2-percent solution (8 ounces per 3-gallon mix), or a combination of the two herbicides should work best. Older, thicker stands may require physical removal combined with follow up herbicide applications.

5. GENERAL MANAGEMENT TECHNIQUES/CONCEPTS FOR INVASIVE PLANT SPECIES.

5.1. General Mechanisms of Invasive Plant Control. There are five basic steps for managing invasive plant species (Kaufman and Kaufman, 2007) which include:

- Prevent the introduction of invasive species. Discourage the use of non-native invasive species in landscaping and erosion control and maintain the quality of natural areas by limiting excessive disturbance and maintaining a cover of native species.
- Learn to recognize invasive plants and monitor natural areas regularly to catch invasions early.
- Prevent invasive plants from reproducing by seed and vegetatively.
- Thoroughly clean all tools and equipment used in managing invasive plants to avoid spreading plants to new areas.
- Share information with other landowners and land managers and work cooperatively to prevent and control invasive plant species.

5.2. Prevention is the first line of defense and the easiest course of action. When selecting plants for landscaping, learn what plants are invasive in the area and avoid planting them. If invasive plants are already planted on the installation, consider removing them and replacing them with native species. Monitor the installation for the appearance of new populations of an invasive species. It is always easier to remove something as soon as it appears than to wait until it is established and reproducing. Many invasive plants get their start on disturbed ground and in areas where native plant cover has been damaged. It is important to monitor these areas and to restore native plant communities. Monitoring is especially important after earth moving, logging, hurricanes and tornadoes, floods, and fires. These disturbances provide opportunity for many invasive plant species to become established.

5.3. Develop management plans for site-specific areas where invasive plants are abundant. Map out which invasive plants occur in what areas and categorize the level of infestation (light, moderate, and heavy). Based on this information, determine which areas have top priority for removal. This might be areas with rare plants or animals, heavily infested areas near high quality uninvaded habitat, areas with new, still small, invasions, or places like streambanks and road edges from which invaders are likely to spread.

5.4. Once priority areas are established, determine when and how each area will be controlled. Control techniques can be broken down into mechanical, physical and chemical (and possibly biological) controls (or combinations thereof). Mechanical controls vary from hand pulling plants to mowing to cutting them down with chainsaws. Generally, mechanical controls are less expensive, less intrusive, and safer but more labor-intensive.

5.5. Hand pulling is often effective for controlling young plants or plants without extensive root systems. For larger plants, tools like a weed wrench, root talon, or mattock can be used to pull up or dig up plants. The disadvantage of pulling or digging plants is that it often causes soil disturbance, which can create new sites for invasive seeds to germinate. Seeding with native species may help limit this invasion.

5.6. In some situations, brush cutters or brush mowers can be used to mow down small shrubs, tree seedlings, grasses and taller herbaceous plants. In other cases, chainsaws, axes, loppers and other cutting tools can be used to cut down one tree or shrub at a time. Many plants are capable of sending out roots from cut plant parts or of maturing seeds even after the plant is cut down. Therefore, all plant parts should either be burned on site or removed off-site (being careful not to spread them to new locations).

5.7. Grazing by animals and burning are another means of controlling some invasive plants, and can be very effective in certain situations. Different grazing animals have different food preferences, and some like goats, will eat almost any woody plant whether native or not. Grazers may also disperse seeds if they eat fruit or seed heads. Burning can kill some species, but it may also stimulate seed germination or vigorous root sprouting. Use of livestock incurs special issues and is not likely to be used.

5.8. Chemical control involves the use of herbicides. Although many prefer not to use herbicides, in some cases they are the only effective method of control for particular species. Many herbicides can be applied with less disturbance to soils and surrounding vegetation. Depending on the mode of action, some herbicides are effective against certain types of plants while not affecting other types.

5.9. Biological controls are often insects that attack plants, but they can also be fungi, bacteria and other animals. Many insects are deliberately sought out, bred, and released to control invasive plants. For biological control, the goal is to find insects that attack particular invasive species without posing harm to native species or economically important species. Generally, biological control agents do not eliminate a species, they simply keep it in check and prevent it from spreading. Biological control resources are typically not readily available.

5.10. Controlling Invasive Plants using Herbicides.

5.10.1 All pesticide applications must be accomplished in accordance with the JBLE-Eustis Integrated Pest Management Plan and all related work must be approved by the IPMC. All applicators of herbicides must be either DoD certified or state certified (by Virginia Department of Agriculture & Consumer Services) in the applicable category. Typically, those categories are aquatics, forestry, turf, and right-of-way. All applications are recorded and reported to the IPMC.

5.10.2. Herbicides are grouped generally by how they kill or suppress the growth of a plant. Some herbicides act on certain types of plants such as only grasses only or woody plants. Other herbicides are known as non-selective or broad-spectrum herbicides that kill almost any plant. The two types of non-selective herbicides are those that kill on contact and those that are absorbed into the plant (systemic herbicide). Contact herbicides kill the foliage, but not necessarily the roots or seedlings. Additionally, preemergent herbicides are applied to soil to prevent germination of seeds.

5.10.3. Most selective herbicides are also systemic herbicides. Herbicides work by inhibiting the production of certain amino acids, disrupt cell membranes, inhibit the synthesis of lipids, or have other effects on a plant's metabolism. Some systemic herbicides are applied to the soil before the seeds germinate and are called pre-emergent herbicides. They prevent seed germination or inhibit the formation of plant tissue. Post-emergent herbicides are applied to the growing plant. Most modern systemic herbicides have little effect on animal species because they target chemical pathways specific to plants.

5.10.4. The differences among brand name herbicides often relates to the active chemicals in different quantities and dissolved in different solvents (e.g., water, oil or alcohol). Many will also contain what are called surfactants or adjuvants. Surfactants are chemicals that help the chemical stick to the leaf or penetrate the leaves outer layer by reducing the surface tension of water. An adjuvant makes the herbicide more effective or safer for people to use. Although the active ingredient in the herbicide may be considered non-toxic to animals, the surfactant or adjuvant may not be so benign so caution should be used when handling any herbicide. Each herbicide will have a label stating which plants it effectively controls and what quantities and concentrations should be used.

5.11. Techniques for Herbicide Application.

5.11.1. Spraying.

5.11.1.1. Many herbicides are designed to be sprayed onto foliage. These are usually mixed with water and sometimes a surfactant. A dye is sometimes added to distinguish plants that have been treated. The disadvantage of spraying is that adjacent non-target plants could be killed, but it works well where there is a solid stand of the target plant. Spraying is also safer and more effective when plants are low growing since holding a spray nozzle over your head is both tiring and dangerous. This can also result in more non-target plants being affected.

5.11.2. Most plants should be sprayed between midsummer and late fall before the end of the growing season. In some cases, applications are needed in winter or early spring when other plants are dormant. Japanese honeysuckle is an example of a species where fall or winter spraying can be very effective since this will minimize impacts to non-target species. Spraying is recommended when the temperature is above 55° F and below 80° F generally (however, consult the herbicide label). Spray until the leaves are wet but not dripping. Do not spray on days of adverse weather such as storms, rainfall or winds typically exceeding 10 mph (however, consult the herbicide label). Early mornings provide cooler temperatures and less wind,

however, heavy dew in the morning may affect herbicide contact with the leaves of plants. Additionally, early mornings may be characteristic of temperature inversions whereby applications should be avoided to prevent drift to non-target areas.

5.11.3. Various types of spray equipment are available. Hand pump sprayers work well for small sites. Backpack sprayers hold more liquid, and some have motors to regulate the volume of spray. Larger spray equipment with tanks can be mounted on tractors, trucks, or off-road vehicles.

5.12. Hack and Squirt. The hack and squirt method involves cutting into the bark of a tree or large shrub and then squirting herbicide into the cut. This allows the herbicide to get directly into the plants circulatory system with little risk of contaminating surrounding desirable vegetation. Care should be taken not to girdle a tree when making the cuts as that can cause some species to send up root suckers or resprouts. One cut for every 4 inches in diameter of trunk should be effective. Squirt bottles can be used to squirt the herbicide into the cut. Generally, the best time of the year for hack and squirt is late in the growing season when plants are beginning to translocate nutrients down to the roots. Triclopyr and glyphosate are most commonly used for the hack and squirt method. Triclopyr can be used when temperatures are colder but can volatilize when temperatures are over 80° F.

5.13. Cut Stump. This method involves the cutting of trees and shrubs to the ground, and the painting or squirting of herbicide onto the cut tissue. Handheld spray bottles, sponge paintbrushes, and squirt bottles work well for this. Similar to the hack and squirt method, this method minimizes risk to surrounding vegetation. This method also works best on species unlikely to send up root suckers and can be done throughout most of the year if temperatures are favorable. Glyphosate and triclopyr are the herbicides most frequently used for this kind of treatment.

5.14. Basal Bark. For basal bark application, the herbicide is generally mixed with oil so that it will have time to penetrate the bark of the tree or shrub. Herbicide is sprayed or painted onto the bark at the base of the tree in a 6 to 15 inches wide band. Basal bark treatments are usually done in cooler weather since the herbicides volatilize at higher temperatures. The advantage of this method is that a large number of plants can be treated fairly quickly. After trees die, they can be cut down or left to fall on their own.

5.15. Restoration following removal of invasive plants.

5.15.1. Restoration is the most important final phase of an integrated invasive plant eradication program. This phase requires the establishment of fast-growing native plants that can outcompete and outlast any surviving non-native plants while stabilizing and protecting the soil. If the soil seed bank remains intact, native plant communities may naturally reinitiate succession after eradication of non-native plants. Light-seeded native species are usually present in the seed bank while heavier seeded plants will gradually be deposited on a site by birds and other animals. Large seeded species can be planted to speed up the natural successional process.

5.15.2. Native plant seed and seedlings are available for sowing and planting. There are currently many nurseries that specialize in the production of seed and plants of native species. It may be beneficial to establish fast-growing tree species during the later control phase to hinder the reestablishment of shade intolerant non-native invasive plants. Reestablishing native grasses and forbs is equally important. Native plant seeds require appropriate storage and planting techniques and times to assure successful germination. Seedling native plants can also be collected and transported from other suitable sites or purchased from a nursery specializing in native plants.

5.15.3. Even after native plants are seeded and planted, sites will need regular monitoring to ensure that non-native species do not become reestablished. This monitoring will often be needed for many years as the seed from many non-native invasive plants remain viable for many years. Both the treatment and eradication of any non-native plants and the restoration of the site with native plants are critical to preventing and controlling invasions in the future.

6. MANAGEMENT OF VERTEBRATE INVASIVE SPECIES.

6.1. Coyote (*Canis latrans*).

6.1.1. Status of populations on the installation. The existence of coyotes on the installation was confirmed in 2009 based on natural resources staff observations; though the existence was suspected prior to this time frame based on reports from recreational hunters. Since 2009, monitoring was implemented by using wildlife cameras, field observations by the Conservation Branch (now Natural Resources & IPM Team) and limited trapping. Data is insufficient to estimate the population. However, several individuals were observed on pre-placed wildlife cameras as well as being personally seen by natural resources staff. Additionally, five individuals were trapped in 2010, and one each in 2017 and 2018. At the time of this revision, coyotes have been observed on the dredge spoil facility, Landfill 15, The Pines Golf Course, and several training areas.

6.1.2. Need for Control. This highly adaptable and moderately large canine predator can devastate a number of native wildlife species on the installation especially because JBLE-Eustis is a partially isolated ecosystem. Natural barriers such as the James and Warwick Rivers in conjunction with development and fencing systems on the installation as well as external road networks, Newport News development and the Newport News Reservoir limit movement of deer, small mammals, reptiles, and some avian species. Ground-nesting birds such as bobwhite quail (*Colinus virginianus*) and wild turkey (*Meleagris gallopavo*) are particularly at risk. Overall, this species would decrease the biodiversity and impact wild turkey hunting and to a lesser extent deer hunting. Additionally, coyotes may pose safety and health concerns for the installation community. Though not normally aggressive, coyotes could pose threats to small children and pets in housing areas or could seriously injure persons if cornered or harassed. At least two individuals have been observed in the cantonment area. More importantly, evidence exists of coyote depredation of deer fawns and are expected to impact wild turkeys. Turkey population appears to be lower within the 3 years. Additionally, bobwhite quail populations on the installation are extremely low and may also be impacted by coyote depredation. Coyotes are

susceptible to the rabies virus and thus could pose an additional risk. Additionally, seven coyotes captured between 2010 and 2017 had high ixodid tick loads and several were infected with tick-borne pathogens.

6.1.3. Management Techniques.

6.1.3.1. Natural resources staff record known and suspected coyote sightings and signs as part of a monitoring program via visual encounters, surveys, and wildlife cameras.

6.1.3.2. Recreational hunters may take unlimited coyotes during Virginia hunting seasons.

6.1.3.3. Natural resources staff shoot or trap coyotes in selected areas when feasible based on time/resource and access availability to training areas and golf course throughout the year.

6.1.3.4. When financial resources are available, U.S. Department of Agriculture-Wildlife Services (USAD-WS) can be contracted to perform coyote removal.

6.2. Nutria (*Myocastor coypus*).

6.2.1. Status of populations on the installation. At the date of this revision, nutria have not been documented on the installation; however, one suspected sighting occurred in 2015.

6.2.2. Need for control. Nutria wreak havoc on native wetland vegetation through intense feeding, construction of large vegetation mats and burrowing into banks of streams and wetlands. In some cases, they may overtake muskrat burrows and compete against muskrats for resources. Currently, large portions of JBLE-Eustis wetlands are damaged from invasive vegetation particularly common reed as discussed in this plan. Further damage to native wetland vegetation by nutria pose even greater impacts on wetland habitats. This impacts overall biodiversity but also could contribute to flooding and erosion.

6.2.3. Management techniques. Monitoring is the current technique for this species; however, it is a resource-intensive action. When feasible/available, natural resources staff develop cooperative monitoring projects with federal and state wildlife agencies and/or university research projects related to nutria. Time/resource permitting, monitoring by natural resources staff is performed twice annually at pre-selected wetlands to observe for individuals, damaged vegetation, creation of vegetation mats and burrowing. When financial resources are available, U.S. Department of Agriculture-Wildlife Services (USDA-WS) is contracted to perform nutria surveillance.

6.3. Invasive Bird Species.

6.3.1. Rock dove (*Columba livia*), European starlings (*Sturnus vulgaris*), and English house sparrows (*Passer domesticus*).

6.3.1.1. Status of populations on the installation. Actual populations on the installation are unknown though all three avian species are well established on the installation as they are throughout most of North America.

6.3.1.2. Need for control. All three species are invasive/non-native and are not subject to protection of the Migratory Bird Treaty Act. They out compete native bird species for resources. Equally important is that they tend to be communal nesters and roost in large numbers. In some cases, these species may do so in or around structures on the installation. In such cases, this leads to unsanitary conditions to include large amounts of fecal matter potentially containing the fungus *Histoplasma capsulatum*. In some cases, these species enter food handling facilities. Additionally, European starlings are hosts for eastern fowl mites (*Ornithonyssus sylviarum*) which can parasitize people.

6.3.1.3. Management Techniques. These species are normally controlled as pest species in accordance with the JBLE-Eustis Integrated Pest Management Plan. Pest control professionals within the 733 Civil Engineer Squadron implement control measures of these species in situations posing immediate health concerns in structures. In some situations, USDA-WS may be utilized if resources are available. Pest control staff first confirm through the Natural Resources & IPM Team, Environmental Element that these are the species associated with situation before taking action. Building exteriors shall be monitored for damage that allows entrance by these species and repaired to exclude them. USDA-WS remove rock doves and starlings by trapping at Felker Army Airfield.

6.3.2. Mute swans (*Cygnus olor*).

6.3.2.1. Status of populations on the installation. This species has been observed in areas adjacent to the installation; however, no breeding populations have been documented on the installation at the time of this revision.

6.3.2.2. Need for control. Mute swans actively compete with native waterfowl for necessary resources, may come into conflict with people based on observed aggressive behaviors, and may damage submerged aquatic vegetation (SAV).

6.3.2.3. Management techniques. Though mute swans are non-native birds, they are protected under the Migratory Bird Treaty Act (MBTA) based on the U.S. Court of Appeals for the District of Columbia Circuit Court that ruled on December 28, 2001, that these swans were of the waterbird family Anatidae and thus protected by the Migratory Bird Treaty Act. Consequently, any action taken to control this species on the installation will require permits from the U.S. Fish and Wildlife Service. No specific surveys are intended under this plan, but actions shall be determined if the species is sighted. Resources will be needed should they become documented. In this case, natural resources staff shall first explore contracting with USDA-WS for removal.

6.4. Feral domestic animals. Feral domestic animals include cats, dogs, swine, goats and others. The only confirmed feral domestic animal is domestic cats at JBLE-Eustis. Virginia Code (Title 3.2. Agriculture, Animal Care, and Food; Subtitle V. Domestic Animals, Chapter 65. Comprehensive Animal Care, Article 1. General Provisions, § 3.2-6500. Definitions) considers

feral domestic cats as companion animals. This term refers to “any domestic or feral dog, domestic or feral cat, nonhuman primate, guinea pig, hamster, rabbit not raised for human food or fiber, exotic or native animal, reptile, exotic or native bird, or any feral animal or any animal under the care, custody, or ownership of a person or any animal that is bought, sold, traded, or bartered by any person. No agricultural animal or game species, or animal actively involved in bona fide scientific or medical experimentation shall be considered a companion animal for the purposes of this chapter.”. Consequently, domestic cats are not labelled as pests in the Commonwealth of Virginia.

6.4.1. Status of Populations on the Installation. Feral domestic cats have existed on the installation for an undetermined period of time. Most individual cats originated from locations outside the installation boundary particularly the city of Newport News. The installation does not own or manage domestic cats and only privatized housing residents would have cats as pets which must be under the owner’s control and not allowed to run loose. The actual population is unknown since surveys for such would be difficult and time consuming.

6.4.2. Need for control. Feral domestic cats impact native wildlife populations because they function as non-native, non-natural predators by decimating songbirds, ground-nesting birds (such as wild turkey, bobwhite quail and woodcock), reptiles, amphibians and small mammals. They also serve as hosts and reservoirs for tick-borne diseases and rabies. These diseases are pathogenic to humans that are serious issues for the health and welfare of military personnel and their families as well as civilian employees and contractors in both cantonment and training areas.

6.4.3. Management techniques. Currently, there is no management system in place since the Environmental Element/Natural Resources & IPM Team staff is not responsible for domestic animals which are not wildlife. Additionally, no responsibility is taken by US Army Department of Public Health no veterinary services. Mostly significantly, there is no facility by which to send live-trapped cats. As of the date of this INRMP, the Peninsula Regional Animal Shelter refuses to accept stray domestic cats from the installation unless compensatory funds are remitted. At this time, no agreement or line of accounting funds exist.

7. MANAGEMENT OF INVASIVE INVERTEBRATE SPECIES

7.1 Identification of known invasive invertebrates. The current list of known invasive invertebrate species (or being potentially invasive at the installation) occurring on JBLE-Eustis as of 1 January 2024 is as follows:

- Japanese beetle (*Popillia japonica*).
- Kudzu bug (*Megacopta cribraria*).
- Asian tiger mosquito (*Aedes albopictus*).
- Brown marmorated stink bug (*Halyomorpha halys*).
- Red imported fire ant (*Solenopsis invicta*).
- European hornet (*Vespa crabro*).
- Chinese mantis (*Tenodera sinensis*).

- Asian lady beetle (*Harmonia xyridis*).
- Ribbed pine borer (*Rhagium inquisitor*).
- *Ambrosiodmus rubricollis* (no common name).
- *Euwallacea validus* (no common name).
- Fruit-tree pinhole borer (*Xyleborinus saxesenii*).
- Alnus ambrosia beetle (*Xylosandrus germanus*).
- Asian Ambrosia Beetle (*Xylosandrus crassiusculus*)
- Shovel-headed garden worm or hammerhead worm (*Bupalium kewense*).

7.2. Kudzu bug status and control. This species has been documented once on the installation and the extent of its distribution is unknown. It primarily is an agricultural crop pest, and it is not expected to pose as a significant pest of native habitats. As the common name implies, it does feed on kudzu (an invasive plant noted above); however, most kudzu originally occurring on the installation has been brought under control. However, kudzu bugs may invade occupied structures in large numbers becoming a household pest. Further, it has been known to bite humans though it is not hematophagous or a disease vector. No reports of this species entering buildings on the installation or serving as a biting nuisance has been reported. Currently, the species is not expected to be common based on limited preferred food sources. Pest control techniques shall be examined on a case-by-case situation should pest control requests be received for this species. Additional control measures shall consist of surveillance for kudzu and this insect as well as monitoring USDA and Commonwealth agencies reporting.

7.3. Brown marmorated stink bug status and control. This species is commonly observed and well established on the installation. It is primarily an agricultural pest of various crops and fruit trees. It is known to feed on maple and ash trees. No data exists of significant damage to native trees on the installation. It is known to enter structures including occupied buildings in the fall. In these cases, the species is a nuisance as this can result in large numbers and they are able to release an unpleasant odor. They do not bite or serve as a disease vector of humans. No records of this pest entering structures in large numbers has been reported at JBLE-Eustis. Pest control techniques shall be examined on a case-by-case situation should pest control requests be received for this species. Physical or mechanical removal from structures shall be considered first. Use of appropriate pesticides shall be considered if other control techniques are not effective.

7.4. Japanese beetle status and control. This species is ubiquitous throughout the installation primarily from June through September (adults emerge between May and July depending on the soil temperature). Larvae feed on roots of various plants while in the soil and adults are host plant generalists feeding on foliage, flowers and fruits of various plants. Some noted impacts were on native marsh mallow in wetlands on the installation by adults where the plants achieved high beetle loads. Control is primarily via insecticide sprays if applications can occur with limited impacts on non-target organisms particularly insect/arthropod predators and pollinators. Use of milky spore powder (containing spores of *Bacillus popilliae*) against grubs shall be used when and where feasible. Surveys of grub habitat is needed to determine the presence and extent of grubs prior to application of the powder. The native scoliid wasp (*Scolia dubia*) is a natural predator of the beetle and has been documented on the installation. Additionally, certain native

assassin bugs (Hemiptera: Reduviidae) have been observed feeding on Japanese beetles at JBLE-Eustis.

7.5. Asian tiger mosquito status and control. This mosquito is a significant nuisance biter and potential disease vector. While it has been documented on JBLE-Eustis, actual numbers were low as observed in the 2017 mosquito inventory. However, resources on the form of time and manpower have been limited since that survey. Additional mosquito species surveys/inventories are needed to ascertain the extensiveness on the installation. These surveys/inventories should be considered for 2024 and annually thereafter. Control measures in the form of breeding site source reduction is the best control course of action. Ground and aerial insecticide spray represent techniques used when other non-chemical techniques are deemed in effective. These pesticide applications shall be executed in accordance with the JBLE-Eustis Integrated Pest Management Plan.

7.6. Red imported fire ant (RIFA) status and control. Establishment on the installation creates significant impacts to both wildlife (such as ground-nesting birds, small mammals and herpetofauna) and human health & safety. An initial colony was found in cantonment adjacent to the Shoppette (BLDG 704) in 2013 and was eliminated following pest control using appropriate ant bait. A second colony was found in the Sling Load Training Area and Landing Zone (STALZ) in Training Area 28 in December 2020 and was also eliminated. However, several more colonies have been found since them between 2021 and 2023 and various locations in cantonment and the Aviation Complex contraction site. It is thought the colonies became established following the placement of soil contaminated with the ants during construction. The species is now considered established on the installation. The following control techniques shall be implemented:

- Surveillance by Natural Resources & IPM Team staff and BOS contractors to the extent practical for time and manpower.
- Natural Resources & IPM Team staff shall maintain a record of pest colonies and those colonies not yet eradicated.
- All USACE project managers, 733 CES engineer project managers, and maintenance staff must obtain approval of soil and other VDACS-regulated articles before such materials are brought onto the installation in accordance with Environmental Management Procedure (EMP) 4.4.6.16 and the JBLE-Eustis Integrated Pest Management Plan.
- All members of the installation community shall report known or suspected colonies to the 733 CES/Natural Resources & IPM Team staff while avoiding contact with colonies or taking their own actions.
- Only VDACS-certified BOS pest control staff or appropriately DoD pest management certified Natural Resources & IPM Team staff are authorized to treat RIFA colonies unless otherwise approved by the Installation Pest Management Coordinator.
- Actual execution of control techniques shall occur in this order:
 - Identify an active RIFA colony and assess locations of mounds or colony entry sites.
 - Notify personnel in immediate area of the colony.

- Execute baiting techniques as first control measure in accordance with the label of an approved RIFA bait.
- Monitor the effectiveness of the baiting technique in accordance with the label. However, it may be conceivable to place sticky traps around mounds (must be attached to the ground and possibly construct some overhead cover to mitigate rainfall).
- Report the effectiveness or when the colony appears eradicated to the IPMC.
- Other control techniques can be considered and should be discussed with the IPMC such as mound drenching with an approved pesticide or pouring hot water into the colony. Monitoring effectiveness during cold winter weather (when the ants are not active) could be performed by using a hand auger to remove soil core samples and examine for ants.

7.7. European hornet and Chinese mantis status and control. The European hornet and the Chinese mantis are documented on the installation. The European hornet is predatory on other insects and is known to girdle twigs by which to obtain sap while the Chinese mantis is a general predator that competes with native mantids and is known to feed on small vertebrate prey (including anurans, lizards and hummingbirds). Natural resources staff observed competition behaviors between European hornets and other insects for food sources. Though documented on JBLE-Eustis, information as to the distribution on the installation is lacking as is the extent of their impacts on native fauna.

- Chinese mantis. No large-scale control for this insect is feasible. Natural Resources & IPM Team staff can monitor for ootheca attached to trees and various other surfaces in the fall and remove these if identification can be made.
- European hornet. No large-scale control for this insect is feasible. Opportunistic observations or reporting by installation community members of colonies shall be documented. IPMC/Team staff shall evaluate removal of documented colonies on a case-by-case basis to determine the best course of action with physical and mechanical control considered first followed by application of appropriate insecticides by certified personnel.

7.8. Asian lady beetle (*Harmonia xyridis*) status and control. This predatory beetle was intentionally introduced from Asia as a biological control of aphids. It is now well established and occurs through the US. It is commonly observed on the installation. It competes with and is known to feed on native lady beetles and is known to be a agricultural pest in some cases. Additionally, it can become a nuisance by entering occupied buildings in large numbers with the approach of winter. It can also release a foul-smelling liquid when threatened. No reports exist of large numbers affecting personnel of occupied buildings. Team staff have observed this species throughout the installation and in some cases observed congregation of moderately numbers outdoors at some structures. No large-scale control system is feasible. Removal when large numbers enter structures shall be executed using physical or mechanical means.

7.9. Hammerhead worm (*Bipalium kewense*) status and control. Hammerhead worms (also known as the shovel-headed garden worm) is a large predatory land planarian (also called land flatworms). This species originated from southeast Asia but is now cosmopolitan. Residents in military privatized housing shared a photo of this species from their garden in 2018. This species can be detrimental to soil habitats by preying on earthworms. No data or survey work exists to assess the extent of potential impact. Survey work in the form of educating the installation community to report observations or submit specimens to Natural Resources & IPM Team staff would serve as an initial surveillance program.

7.10. Other invasive invertebrates. Natural Resources & IPM Team staff have documented the following potentially invasive nonnative insects:

- Ribbed pine borer (*Rhagium inquisitor*).
- *Ambrosiodmus rubricollis* (no common name).
- *Euwallacea validus* (no common name).
- Fruit-tree pinhole borer (*Xyleborinus saxesenii*).
- Alnus ambrosia beetle (*Xylosandrus germanus*).
- Asian Ambrosia Beetle (*Xylosandrus crassiusculus*)

7.10.1. General. Though documented on the installation, there is no sufficient data to assess density within habitats or long-term risks to such from the six species noted above. Further surveys and surveillance is needed to assess risks.

7.10.2. Ribbed pine borer. This longhorned beetle is a potential forest pest of pine. It attacks weakened or dying trees.

7.10.3. *Ambrosiodmus rubricollis*. *Ambrosiodmus rubricollis* is a tiny bark beetle from Asia (Curculionidae: Scolytinae). This beetle tunnels through the sapwood of certain trees. At a minimum it attacks peach trees but is polyphagous. Its presence at JBLE-Eustis and host plant(s) use remains unknown; however, it does attack decayed/dead wood. Common host species include *Carya* spp., *Cornus* spp., *Prunus* spp., and *Quercus* spp.

7.10.4. *Euwallacea validus*. *Euwallacea validus* is another tiny bark beetle from Asia (Curculionidae: Scolytinae). It is a polyphagous species that often uses dead or dying trees though there is potential for transmission tree fungal diseases.

7.10.5. Fruit-tree pinhole borer. The Fruit-tree pinhole borer is another adventive polyphagous, potential forest pest bark beetle (Curculionidae: Scolytinae). It retains a wide host plant range including ornamental trees and timber. Nearly all pine/conifers as well as hardwoods (particularly oak, hickory, beech, and maple) are susceptible. This species feeds only in dying trees.

7.10.6. Alnus ambrosia beetle. Also called the black stem borer, this species is another adventive from Asia and is widespread across North America. It attacks recently cut hardwoods (including oak, walnut and beech) but can also occur on living trees. There may be some over 200 host species that it attacks.

7.10.7. Asian Ambrosia Beetle. The Asian Ambrosia Beetle is another adventive bark beetle from Asia. It attacks over 100 tree species including tyrax, dogwood, redbud, maple, ornamental cherry, Japanese maple, crape myrtle, azalea, Chinese elm, fig, golden rain tree, magnolia, peach, pecan, persimmon, plum, and Shumard oak.

7.11. Invasive invertebrate organisms with potential for establishment on JBLE-Eustis. The following invertebrate organisms could become established on JBLE-Eustis in the near future. Survey work and surveillance are key to managing these pests:

- Red swamp crayfish (*Procambarus clarkii*)
- Rusty crayfish (*Orconectes rusticus*)
- Asian long-horned beetle (*Anoplophora glabripennis*)
- Spongy moth (*Lymantria dispar*)
- Sirex woodwasp (*Sirex noctilio*)
- Spotted lanternfly (*Lycorma delicatula*)
- Redbay ambrosia beetle (*Xyleborus glabratus*)
- Beech scale (*Cryptococcus fagisuga*).
- Yellow-legged hornet (*Vespa velutina*).

7.11.1 Red swamp crayfish and rusty crayfish. A limited crayfish survey was executed with assistance from the Virginia Department of Wildlife Resources in September 2023. Neither invasive crayfish was observed and no previous observation had been recorded. Red swamp crayfish have been found within 5 miles of installation in York County. Information about the rusty crayfish in the local information is not available.

7.11.2 Asian long-horned beetle. This species has been documented in Massachusetts, New York and Ohio, and is not yet a pest in Virginia. Certain hardwoods at risk include ash, birch, elm, horse chestnut/buckeye, golden raintree, london planetree/sycamore, katsura, maples (including boxelder, red, silver and sugar maple), mimosa, mountain ash, poplar, and willow. Currently, surveillance is the primary task.

7.11.3 Spongy moth. Formerly called the European gypsy moth, this species has undergone a common name change. This species is expected to occur locally though none have been documented on the installation to date. Outbreaks can result in severe defoliation of various hardwood trees by the immature stages. Surveillance is an annual task performed by the 733 CES BOS pest control contract staff. However, given time constraints impacting a 2-person pest control staff, modification of surveillance is recommended as follows:

- Transfer responsibility of surveillance to the Natural Resources & IPM Team staff.
- Focus surveillance in the forest compartments/locations: (1) Compartment #29 that comprises Training Areas 1 & 2, (2) Compartment #26/Nature Trail, (3) Compartment #30/Tracey Place, and (4) bald cypress surrounding the athletic fields at the intersections of Taylor Avenue and 24th Street.
- Conduct egg mass surveys between October and February.
- Conduct pheromone trapping for adults between June and September.

- Outbreaks or higher densities would be expected in areas containing deciduous hardwood trees. The acreage size is relatively small compared to areas where loblolly pine is dominant. This may allow for physical removal of egg masses and caterpillars, or use of tree banding.
- Ground applications of appropriate can be utilized that target the feeding immature stages including *Bacillus thuringiensis* var. *kurstaki* (Btk), diflubenzuron (growth regulator), tebufenozide (growth regulator), and broad spectrum contact insecticides such as carbaryl and bifenthrin.

7.11.4 Sirex woodwasp. A forest insect survey conducted in 2014-2015 did not find the sirex woodwasp nor was it observed during the Cooperative Agricultural Pest Survey (CAPS) performed at 3d Port between 2006-2017. It is found in New York, Connecticut, Ohio, Pennsylvania, Michigan, and Vermont. Its distribution in Virginia is uncertain; however, loblolly pine which is important host plant, is common at JBLE-Eustis.

7.11.5 Spotted lanternfly. This species is serious pest of grapes, peaches, hops, and a variety of other crops but its potential impacts on natural habitats is uncertain. This species is thought to damage several hardwood trees including willow, maple and poplar. It was documented in in Frederick County, Virginia, in January 2018. Currently, the cities of Radford, Roanoke and Salem, and Roanoke, Bedford, Campbell and Amherst counties have known populations. Tree of heaven serves as a preferred host plant for the spotted lanternfly. This invasive plant once existed across several areas of the installation. However, considerable control efforts have greatly diminished its presence on the installation. Reduction and eventual eradication of tree of heaven from the installation serves to reduce the risks of spotted lanternfly establishment. Surveillance should be implemented that includes the following tasks:

- Inform the installation community to be cognizant of what the spotted lanternfly looks like, and report known or suspected observations or bring suspected specimens to the IPMC/Natural Resources & IPM Team. This could be accomplished by posting on the JBLE website, organize as part of an Earth Day event, etc.
- Eliminate remaining stands of tree of heaven from the installation.
- Visual inspection/monitoring of selected areas in September for adults and deposited egg masses. Collect and kill any that are found. Surveillance of selected areas can occur in the spring when immature stages hatch. Both adults and immature stages are distinctive and both may be gregarious when feeding.
- Trapping methods may serve as the best course of action for surveillance and control.

7.11.6 Redbay ambrosia beetle. This very small beetle vectors the fungus *Raffaellea lauricola* that causes laurel wilt in redbay trees (*Persea borbonia*) and also sassafras (*Sassafras albidum*). Laurel wilt results in mortality of affected trees. Currently the beetle ranges from Florida to the southeastern portion of North Carolina. However, the Virginia Department of Forestry documented a case of laurel wilt in sassafras in Scott County, Virginia, in June of 2021. Redbay trees are documented as one of several dominant trees in Forestry Compartments #01, 02, 03, 06, 07, 08, 09, 36 and 37 per the 2021 Timber Inventory and Forest Management Plan.

Surveillance should be initiated and include the following:

- Conduct a field assessment to identify individual or stands of redbay in the respective forest compartments.
- Map these areas with GIS data.
- Assess the health of these trees particularly regarding laurel wilt symptoms or mortality.
- Develop a survey/trapping system to determine whether the beetle exists. Manuka oil (an extract from *Leptospermum scoparium*) and Phoebe oil (an extract of Brazilian walnut (*Phoebe porosa*)) are useful baiting attractants for this beetle. Additional research on other baits may be needed if these are not available.

Control of the beetle is difficult if not impractical once it is established in the host trees. Contact pesticides whether applied by ground or aerial means are ineffective given the targeted beetle would exist within the infected trees. Infected trees would likely need to be burned on site and not transported off the installation. Replanting of redbays could be considered if confident all infected trees had been eliminated.

7.11.7 Beech scale. This insect causes beech bark disease by vectoring the fungus *Nectria coccinea* var. *faginata* or *Nectria galligena*. It feeds on the sap of beech trees thereby creating cracks in the bark. The fungi colonize these areas causing bark cankers. This condition is capable of killing all size classes of American beech. By the 1980s, beech bark disease was widespread in Pennsylvania and West Virginia. Isolated infestations exist in the mountains of Virginia and North Carolina. The installation contains stands of beech primarily north of Taylor Avenue.

7.11.8. Yellow-legged hornet. This is an Asiatic social wasp that was first documented in the US in August 2023 in Georgia. It's uncertain whether that colony or the species has been eradicated. No immediate data was available regarding its occurrence in Virginia at the time of this INRMP/Invasive Species Management Plan was revised. This species builds nests above ground typically in trees or human structures. It is a predator of other insects including honeybees.

7.12. Participation in the Cooperative Agricultural Pest Survey (CAPS). JBLE-Eustis began participating with Virginia Polytechnic Institute and State University performance of the CAPS program in 2005 with continued involvement annually through 2022. These efforts focus on wood-boring invasive beetle taxa (cerambycids, buprestids & curculionids) that may enter through port facilities. Lindgren funnel traps are used at several locations near the Third Port. Collectively, the following taxa were the focus during this period though none were found JBLE-Eustis:

- *Agrilus auroguttatus*
- *Agrilus biguttatus*
- *Agrilus planipennis*

- *Anoplophora chinensis*
- *Anoplophora glabripennis*
- *Anoplophora malasiaca*
- *Callidiellum rufipenne*
- *Callidiellum villosulum*
- *Chlorophorus annularis*
- *Chlorophorus strobilicola*
- *Dendroctonus micans*
- *Hesperophanes campestris*
- *Hylobius abietis*
- *Ips sexdentatus*
- *Ips typographus*
- *Megaplatypus mutates*
- *Monochamus alternatus*
- *Monochamus urussovii*
- *Orthotomicus erosus*
- *Pityogenes chalcographus*
- *Pityophthorus juglandis*
- *Platypus quercivorus*
- *Tetropium castaneum*
- *Tetropium fuscum*
- *Tomicus destruens*
- *Trichoferus campestris*
- *Trypodendron domesticum*

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