U. S. AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Joint Base Andrews – Naval Air Facility Washington

Prince George's and Anne Arundel Counties, Maryland

FINAL

22 OCT 2018

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (AF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-U.S. territories will comply with applicable Final Governing Standards (FGS). Where applicable, external resources, including Air Force Instructions (AFIs); AF Playbooks; federal, state, local, FGS, biological opinion and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, AF-wide "common text" language that address AF 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 AF-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 AF environmental Installation Support Teams (ISTs) and/or installation personnel.

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.

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DOCUMENT CONTROL

Record of Review – The INRMP is updated not less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and AFI 32-7064, ***Natural Resources Management,*** the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team 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 NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAUSIGNATURE PAGES

Andrew 1\1. Purath, Colonel, USAF
Commander, 316th Wing

26 MAR 2019
Date

Genevieve LaRouche
Supervisor, Chesapeake Bay Field Office
United States Fish and Wildlife Service

12/13/18
Date

Paul A. Peditto
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Maryland Department of Natural Resources

6 Feb. 2019
Dato

JBA INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN 2018

ANNUAL REVIEWS/UPDATES

DATE	SECTION/PAGE	COMMENTS	SIGNATURE
20200711	Entire Document	11WG changed to 316WG	

ANNUAL REVIEW AND COORDINATION

This page is used to certify the annual review and coordination of the Integrated Natural Resources Management Plan for Joint Base Andrews, Maryland. By their signature, the certifying official acknowledges that the annual review and coordination of the Integrated Natural Resources Management Plan has occurred for the specified year.

Approving Officials:

2019

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Name **Date**
Title

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Name Ross E. Dotzlaf, Lt Col, USAF Commander, **Date**
Title 316th Civil Engineer Squadron

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EXECUTIVE SUMMARY

The Integrated Natural Resources Management Plan (INRMP) is the primary guidance document for managing natural resources at Joint Base Andrews - Naval Air Facility Washington (JBA). This INRMP addresses natural resource management for JBA, including the Main Base and the two Geographically Separated Units (GSUs), Brandywine Receiver Station and Davidsonville Transmitter Station. JBA encompasses approximately 7,407 acres, and its primary purpose is providing contingency operations in the Nation's Capital with immediate response rotary-assets.

The Sikes Act Improvement Act (SAIA) of 1997 (16 United States Code §670 et seq. as amended) requires military installations with significant natural resources to develop an INRMP and implement cooperative agreements with other agencies, while supporting the military mission. An INRMP is required for JBA because threatened and endangered species have been identified, and JBA performs limited fish and wildlife management; has natural resources based outdoor recreation; and conducts on-the-ground military operations.

This INRMP is an update and reorganization of the 2014 JBA INRMP and is the result of a review for operation and effect done by the United States Fish and Wildlife Service (USFWS) and the Maryland Department of Natural Resources (MD DNR). The review resulted in the desire of the cooperating agencies to update and continue implementing the existing INRMP. No substantive changes were made to the management programs and philosophies or the goals, objectives, and implementation projects, and this INRMP is compliant with SAIA, DoD and Air Force policy.

Specific goals identified in the JBA INRMP are:

- **Goal 1**: Manage natural resources in a manner that is compatible with and supports the military mission while complying with applicable federal and state laws and United States Air Force (USAF) regulations and policies.

- **Goal 2:** Maintain fish and wildlife populations while minimizing potential impacts to the military mission.

- **Goal 3:** Manage rare species using an ecosystem approach, while maintaining the military mission.

- **Goal 4:** Manage vegetation using sustainable and cost effective methods without negatively impacting the mission.

- **Goal 5:** Minimize impacts of invasive and pest species, while minimizing use of chemicals to manage those species, using an integrated management approach.

- **Goal 6:** Protect water resources and minimize impacts to coastal resources consistent with state and federal laws pertaining to water resources.

These goals are supported by objectives and projects, as well as management strategies and actions required to achieve these goals. This updated INRMP provides a description of JBA and its military mission, environment, natural resources and their management. The implementation of this INRMP will ensure

successful support of the military mission at JBA while promoting adaptive ecosystem management to sustain ecosystem and biological integrity and also provide for multiple uses of areas with natural resources.

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 United States Air Force. 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 Air Force adaptability in all environments. The Air Force has stewardship responsibility over 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 Air Force natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of AF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

1.1 Purpose and Scope

The Integrated Natural Resources Management Plan (INRMP) is the primary guidance document and tool for managing natural resources at Joint Base Andrews – Naval Air Facility Washington (JBA). Including the two Geographically Separated Units (GSUs), JBA includes approximately 7,407 acres of federally owned land under the command of the Air Force District of Washington (AFDW) in Prince George's and Anne Arundel Counties in southwestern Maryland.

The management of JBA must be conducted in a way that provides for sustainable, healthy ecosystems, complies with applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. Installation commanders can use INRMPs to manage natural resources more effectively to ensure that installation lands remain available and in good condition to support the military mission over the long term. The INRMP describes the installation history and military mission of JBA, the installation's surrounding communities and natural areas, the physical environment of JBA Main Base and its two GSUs, the ecosystems and biotic environment of JBA, mission impacts on natural resources, and the environmental management system of the installation. The general roles and responsibilities of JBA personnel and partners, training, recordkeeping and reporting requirements are specified. The natural resources program at JBA is described, and a series of management goals and objectives, with projects to implement the INRMP and meet the goals and objectives for the next five fiscal years, are discussed. Finally, the INRMP outlines the procedures for implementing, updating and/or revising the INRMP.

An INRMP is required to be consistent with the Sikes Act Improvement Act (SAIA) of 1997, 16 USC §670a et seq., as amended, and Department of Defense (DoD) Instruction 4715.03, *Natural Resources Conservation Program*. This INRMP is also intended to be consistent with Air Force Instruction (AFI) 32-7064, *Integrated Natural Resources Management*.

This INRMP is an updated version of the 2014 JBA INRMP. Previous INRMPs for JBA were prepared in 2001, 1997, 2007, and 2014. A review of the 2014 document for operation and effect was completed by all required parties and determined that only a minor update, rather than a full revision, is required since there are no military mission changes, no program or management philosophy changes, and no input was received from the United States Fish and Wildlife Service (USFWS) or Maryland Department of Natural Resources (MD DNR) that resulted in changes to the manner in which natural resources are managed at JBA.

Based on the desire to update the INRMP, the 316th Civil Engineering Squadron/Civil Engineering Installation Management (11 CES/CEIE) updated and reorganized the plan in accordance with the DoD INRMP Template. The DoD INRMP Template was used to ensure the plan content would meet Air Force and DoD requirements into the future. The template provides an easy to follow and logical organization for the INRMP.

1.2 Management Philosophy

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

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

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

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

Projects, activities, new development and mission changes are reviewed by multiple entities within JBA. Projects and activities that might impact natural resources are reviewed by 11 CES/CEIE personnel to ensure that planning decisions reflect environmental values, avoid delays later in the process, and head off potential conflicts. Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*, states that the USAF will comply with applicable Federal, State, and local environmental laws and regulations, including the National Environmental Policy Act (NEPA). The USAF's implementing regulation for NEPA is the Environmental Impact Analysis Process (EIAP; 32 CFR 989). EIAP is used to identify projects and activities that might impact natural resources and to help project planners resolve environmental issues early in the planning process. The 11 CES/CEIE Environmental Planning Function (EPF) has primary responsibility for EIAP implementation at JBA. If there are additional environmental compliance requirements, 11 CES/CEIE members facilitate any required consultation or permit applications.

The goal of natural resources management at JBA is to support the military mission by (1) providing for sustained use of its land, water, and air resources; (2) protecting valuable natural resources for future generations; (3) meeting all legal requirements; (4) promoting compatible multiple uses of those resources; and (5) achieving efficiencies and other savings by partnering with interested stakeholders. .

1.3 Authority

The Sikes Act, 16 USC 670a, requires federal military installations with natural resources requiring protection and management to develop a long-range INRMP and implement cooperative agreements with other agencies. This plan was coordinated with the installation, the USFWS and MD DNR. The Air Force natural resources program ensures continued access to land, air and water resources to conduct realistic military training and testing, as well as to sustain the long-term ecological integrity of the resource base.

This INRMP is developed under, and proposes actions in accordance with, applicable DoD and USAF policies, directives, and instructions. AFI 32-7064, *Integrated Natural Resources Management*, provides the necessary direction and instructions for preparing an INRMP. Issues are addressed in this plan using guidance provided under legislation, Executive Orders (EOs), Directives, and Instructions including DoD Instruction 4715.03, *Natural Resources Conservation Program*; Air Force Policy Directive (AFPD) 32-70, *Environmental Considerations in Programs and Activities*, dated July 30, 2018; AFI 32-7065, *Cultural Resources Management,* dated October 6, 2016; and AFI 32-7064. AFPD 32-70 discusses general environmental policy principles, environmental restoration issues, including proper cleanup of polluted sites, compliance with applicable regulations, conservation of natural resources, and pollution prevention. AFI 32-7065 provides guidance on the preservation of cultural resources at USAF installations.

DoDI 4715.03, *Natural Resources Conservation Program*, dated 18 March 2011, identifies the DoD policies and procedures concerning natural resources management and INRMP reviews, public comment, and endangered species consultation. Key requirements are as follows:

- INRMPs are required to be jointly reviewed by the USFWS, state conservation agency, and military proponent for operation and effect on a regular basis, but not less often than every five years.
- Minor updates and continued implementation of an existing INRMP do not require an opportunity for public comment. Major revisions to an INRMP do require an opportunity for public review.

AFI 32-7064, *Integrated Natural Resources Management*, dated 17 September 2004, and certified current on 11 April 2014, provides guidance on how the USAF implements the SAIA. This is a general guidance document on the purpose, development, implementation, and update/revision of INRMPs. Key points include the following:

- INRMPs are to be developed jointly with the USFWS and state conservation agency.
- INRMPs shall support an installation's military mission.
- The review process emphasizes the need for joint annual reviews and review for operation and effect no less than every five years. The guidance also indicates that the review for operation and effect will determine if a revision is required. A revision is not required if the cooperating agencies agree that an INRMP is meeting the intent of the SAIA. Instead, the INRMP can be updated as necessary and implementation continued.

In addition to complying with these three fundamental INRMP regulations, this updated INRMP has been prepared pursuant to applicable federal, state, local, and USAF laws, regulations and policies that pertain to natural resources management on military land.

A Programmatic Environmental Assessment (Programmatic EA) of the 2001 JBA INRMP was completed due to the fact that a Programmatic EA was not prepared for the 1997 INRMP. The Programmatic EA fulfills the requirements of the NEPA. The 2001 INRMP Programmatic EA presented the Preferred Alternative (implementation of the INRMP) and other alternatives, summarized the affected environment, and assessed the environmental consequences of INRMP implementation. It concluded that implementation of the INRMP under the Preferred Alternative would not result in any negative cumulative impacts to the environment. A Finding of No Significant Impact (FONSI) was signed by JBA. As was expressed in the 2007 INRMP update, revisions made to this INRMP are considered to be minor, and implementation is continuation of the Preferred Alternative identified in the Programmatic EA for the 2001 JBA INRMP. As such, the 2001 INRMP Programmatic EA and the FONSI are valid for the updated INRMP and new NEPA analysis has not been conducted. Individual actions or projects that have the potential to impact the environment will be analyzed according to the NEPA process.

The 'Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP' Table, included as an appendix to this plan, summarizes key legislation and guidance used to create and implement this INRMP. Refer to the complete listing of AFIs, the Federal Registry and the US Code to ensure that all applicable guidance documents, laws and regulations are reviewed. Installation-specific policies, including state and local laws and regulations are summarized in the Table 1.

Table 1. State and local policies specific to JBA.

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
Regulations are found in the Maryland Code of Regulations (COMAR) and authorizing statutes in the Annotated Code of Maryland.	
Air Quality	COMAR 26.11; Authority: Environment Article, §§9-313—9-316, 9-319, 9-320, 9-325, 9-327, and 9-328, Annotated Code of Maryland
Disposal of Controlled Hazardous Substances	COMAR 26.13; Authority: Environment Article, Title 7, Subtitle 2
Nontidal Wetlands	COMAR 26.24; Authority: Environment Article, §§5-901—5-911 [Maryland Nontidal Wetlands Protection Act]
Pesticide Use Control	COMAR 15.05.01; Authority: Agriculture Article, §§2-103, 5-204, 5-207, and 5-210.2
Threatened and Endangered Species	COMAR 8.03.08; Authority: Natural Resources Article, §§4-2A-01—4-2A-09 and 102A-01—10-2A-09 [Nongame and Endangered Species Conservation Act]
Threatened and Endangered Fish Species	COMAR 8.02.12, Authority: Natural Resources Article, §4-2A-01 et seq.
Water Management	COMAR 26.17
Soil and Erosion Control	COMAR 26.17.01; Authority: Environment Article, §4-101
Stormwater Management	COMAR 26.17.02; Authority: Environment Article, §§4-201 and 4-203 [Stormwater Management Act]
Water Pollution	COMAR 26.08.01 – 26.08.04 [NPDES permits]; Authority: Environment Article, §§9-313—9-316, 9-319,9-320, 9-325, 9-327, and 9-328

Wildlife	COMAR 08.03; Authority: Natural Resources Article, §§10-101, 10-205, 10-206, 10301, 10-404—10-409, 10-415, 10-418, 10902, and 10-903
Noxious Weeds	Agriculture, Title 9. Regulation and Supervision of Seeds, Turf Grass, Sod, Potatoes, Ginseng and Noxious Weeds, Subtitle 4. Weed Control, Annotated Code of Maryland
Woodland and Wildlife Habitat Conservation	Prince George's County Code §25-117 – 25-124; Authority: Woodland and Wildlife Habitat Conservation Ordinance

1.4 Integration with Other Plans

By its nature, an INRMP is multidisciplinary and provides the summary of natural resources at a specific installation. As a result, information from an INRMP is incorporated into other plans, and other plans help to identify management priorities and potential impacts to natural resources. The INRMP is integrated with a number of other JBA plans, including:

1. Installation Development Plan for JBA (JBA, 2016a)
2. JBA Instruction 91-212: *Bird/Wildlife Strike Hazard (BASH) Program* (JBA, 2014a)
3. Integrated Pest Management Plan (IPMP; JBA, 2018a)
4. JBA Arbor Plan (JBA, 2011)
5. Stormwater Pollution Prevention Plan for JBA (SWPPP; JBA, 2015a)
6. USAF Stormwater Management Plan for JBA (JBA, 2017a)
7. Air Installation Compatible Use Zone (AICUZ) Study (JBA, 2017b)
8. Installation Complex Encroachment Management Action Plan (ICEMAP; JBA, 2012)
9. Joint Land Use Study (JLUS; MNCPPC, 2009)
10. JBA Installation Emergency Management Plan (JBA, 2013)
11. USAF Integrated Solid Waste Management Plan for JBA (JBA, 2018b)
12. Hazardous Waste Management Plan, 316th Wing, Joint Base Andrews Naval Air Facility Washington, Maryland (JBA, 2016b)
13. Spill Prevention, Control, and Countermeasures Plan for JBA (JBA, 2015b)
14. Integrated Cultural Resources Management Plan for Andrews Air Force Base, Maryland (ICRMP; JBA, 2014c)

The INRMP integrates into the IDP for JBA by providing the best available information on the installation's natural resources. In accordance with AFI 32-7062, *Comprehensive Planning*, the IDP shall incorporate the installation INRMP in its sustainable planning. The INRMP is to provide appropriate information and maps for the IDP, including information on wetlands, water resources, threatened and endangered species, natural resources constraints and compliance with the SAIA. The IDP provides relevant information for the INRMP on land use, encroachment, air quality, waste reduction, sustainability development indicators, and future development plans for the installation. The IDP and INRMP for JBA are mutually supportive.

The BASH Program for JBA and the INRMP also are mutually supportive. The BASH Plan (JBA, 2014)

outlines management techniques to mitigate potential aircraft strike hazards caused by both resident and seasonal bird populations and other species of wildlife at the installation. JBA is located in the Atlantic Migratory Flyway, an area of high bird strike potential. Several wildlife refuges reside in the local flying area so JBA is in a stop-over zone for thousands of migrating birds. JBA's unique mission encompasses numerous aircraft departures and arrivals carrying high-level government officials and heads of state. The cost of a catastrophic bird strike cannot be measured in dollars alone due to the Base's highly visible mission. This INRMP includes management activities that specifically address BASH issues relating to birds and wildlife that pose a potential strike hazard as well as the habitat that attracts them. Both the BASH Plan and the INRMP conduct wildlife and habitat management compliant with all federal and state laws and regulations, obtaining regulatory permits as appropriate. The Natural Resources Management section of 11 CES/CEIE is a member of the Bird Hazard Working Group. Section 7.12 provides detailed information regarding the integration of the BASH Program with the natural resources management program at JBA and this INRMP.

The IPMP for JBA and the INRMP are mutually supportive plans. The IPMP (JBA, 2018a) is a framework through which pest management is defined and accomplished on the installation. The plan identifies elements of the program to include health and environmental safety, pest identification, and pest management, as well as pesticide storage, transportation, use and disposal. This plan is to be used as a tool to reduce reliance on pesticides, to enhance environmental protection, and to maximize the use of integrated pest management techniques. Integrated pest management consists of the judicious use of both chemical and non-chemical control techniques to achieve effective pest management with minimal environmental contamination. Adherence to the IPMP will ensure effective, economical, and environmentally acceptable pest management and will maintain compliance with pertinent laws and regulations, including those regarding protected species contained in the INRMP. Section 7.11 provides detailed information regarding the integration of the IPMP with the natural resources management program at JBA and this INRMP.

The INRMP and the Arbor Plan for JBA are mutually supportive plans. The Arbor Plan (JBA, 2011) describes the status and trends of forest cover at JBA. The types of forests and their distribution are discussed, as is the location and condition of trees in the Main Base's landscaped areas, streetscapes and gateways. The Arbor Plan provides detailed plans for tree plantings on the Main Base and prescribes mitigation recommendations for projects that disturb existing forest cover. A plant list containing species recommended for planting and landscape design guidelines are also contained in the Arbor Plan. The INRMP utilizes information in the Arbor Plan on the status, condition and distribution of forest resources at the installation and incorporates the Arbor Plan's forest mitigation recommendations into the natural resources program management. Section 7.8, *Forest Management*, provides additional information regarding the integration of the JBA Arbor Plan with the natural resources management program at JBA and this INRMP.

The JBA INRMP integrates with and supports the Stormwater Management Plan and Stormwater Pollution Prevention Plan by providing the best information available on the installation's water resources. Stormwater management is within the installation's Environmental Management System. The goal of the Stormwater Management Plans is to reduce the discharge of pollutants to stormwater to the maximum extent possible by implementing best management practices (BMPs) and measurable goals for minimum control measures. The Stormwater Pollution Prevention Plan describes the watersheds at JBA, the receiving water bodies for stormwater from JBA, and the impairment status of each for the Chesapeake Bay Program. Proper management of stormwater at JBA will contribute to achieving the water quality standards for the restoration of the Chesapeake Bay. For more information on natural and artificial drainages, stormwater systems and water quality conditions at JBA, see Section 2.2.4, *Hydrology*. Section 7.5, *Water Resources*

Protection, provides detailed information regarding the integration of the Base's stormwater management plans with the natural resources management program at JBA and this INRMP.

The INRMP integrates with and supports the AICUZ program at JBA by providing the best available information on the natural resources of the installation. JBA updated the installation AICUZ Study in 2017 to achieve compatible uses of public and private lands in the vicinity of the airfields (JBA, 2017b). The AICUZ Study provides the information necessary to maximize beneficial use of the land surrounding JBA, while minimizing the potential for degradation of the health and safety of the affected public. The Study also provides land use recommendations to ensure compatible development in the vicinity of JBA. The INRMP contributes to the AICUZ program by including management activities related to BASH, adjacent land uses and vegetation encroachment on the imaginary surfaces for both runways. The AICUZ Study supports the INRMP by providing the best available information on the natural resources management needs of JBA flight operations and on surrounding land uses at JBA. The AICUZ Study is complementary with the JBA ICEMAP and JLUS.

The JBA Installation Complex Encroachment Management Action Plan (ICEMAP) is designed to assist AFDW and the installation commander and staff of JBA in developing a comprehensive plan to manage encroachment challenges and their impacts on the installation's operations (JBA, 2012). The INRMP integrates with and supports the ICEMAP at JBA by providing the best available information on the natural resources of the installation. The installation ICEMAP summarizes the sustainability of urban growth, stormwater discharge, climate change, endangered species and critical habitat, wetlands, groundwater contamination and other issues or challenges at JBA. Opportunities for on-Base ecosystem services are also described in the ICEMAP. The ICEMAP analysis identified increased stormwater regulatory standards in association with restoration efforts for Chesapeake Bay, the effects of climate, and an increase in wetlands at the installation as primary encroachment and sustainment challenges. The INRMP provides the best available information needed for the installation to identify and monitor these encroachment and sustainment challenges. The INRMP also incorporates management needs identified in the ICEMAP to address the challenges.

The INRMP integrates with and supports the Joint Land Use Study at JBA by providing the best available information on the natural resources of the installation. The JLUS prepared with the Maryland-National Capital Park and Planning Commission (MNCPPC, 2009) is complementary to the ICEMAP and contains a section describing the environmental and natural resources of the installation and surrounding areas, providing environmental context for the installation's natural resources. A summary of the environmental plans and studies prepared for JBA and Prince George's County, including the installation INRMP, is also included in the JLUS. Environmental concerns and potential funding for joint environmental initiatives are identified. Environmental strategies outlined in the JLUS include coordination to improve water quality and watershed health, protection and enhancement of green infrastructure in and around the Base, ensuring future development in the vicinity of JBA does not attract birds or waterfowl that pose a BASH risk, and addressing groundwater contamination associated with a former landfill. The INRMP may support these joint environmental initiatives by incorporating projects that contribute to them in the annual Work Plans (see Sections 9.0 and 10.0).

The Installation Emergency Management Plan (JBA, 2013) for JBA addresses natural disasters at JBA, among other types of emergency. The plan provides information and checklists on how to prepare for and respond to hurricanes, tornados, floods, earthquakes and extreme cold or heat. Procedures for responding to hazardous materials and aircraft accidents are also outlined in the Installation Emergency Management Plan. Both natural disasters and major accidents may affect the natural resources of JBA, from damages to

trees to flooding. Section 2.2.1, *Climate*, provides detailed information on the risk of natural disasters at JBA.

The Hazardous Waste Management Plan for JBA (JBA, 2016b) describes the installation's responsibilities and management of hazardous materials. Hazardous materials are handled in a manner that minimizes impacts to the Base's natural resources. The plan includes steps to prepare and prevent spills and pollution of JBA's natural resources, as well as a contingency plan in the event of a hazardous material incident. JBA also operates an Environmental Restoration Program (ERP) to address the identification and clean-up of hazardous materials contamination sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA). More information about the ERP can be found in Section 7.5, *Water Resources*.

The Integrated Solid Waste Management Plan for JBA (JBA, 2018b) details the handling of solid waste materials as part of the installation's environmental management system. Reducing and diverting solid wastes from the waste stream are goals of the Integrated Solid Waste Management Plan, which minimizes impacts to natural resources on the installation and regionally. JBA Main Base contains several former landfill sites. Information on the potential impacts to natural resources at JBA from some of the former landfill sites as part of the ERP is discussed in Section 7.5, *Water Resources*.

The Spill Prevention, Control, and Countermeasures Plan for JBA (JBA, 2017) describes the locations and storage requirements for petroleum and other hazardous materials at the installation. Reporting procedures for oil spills into navigable waters and potential spill prediction pathways to surface water, groundwater, stormwater drainage systems and wastewater drainage systems are included in the plan. Preventing and controlling spills will minimize impacts to JBA's natural resources. Identification of JBA's water resources and sensitive species and habitats in the INRMP allows the Spill Prevention, Control, and Countermeasures Plan to include the best information available to protect the installation's natural resources.

JBA also has an ICRMP for the management of cultural resources at the installation (JBA, 2014). The ICRMP describes the cultural and historical resources at the installation, their preservation and management, base programs affected by cultural resources management and the curation of archeological collections. The management needs of cultural and natural resources may be complementary, such as when historical resources are located in environmentally sensitive habitats like river banks. Section 7.14 provides detailed information regarding the integration of the ICRMP with the natural resources management program at JBA and this INRMP.

INRMP revisions and concurrence with the final plan must be coordinated through the installation chain of command and the 11 CES/CEIE. The Natural Resources Manager (NRM) must ensure that the INRMP, BASHP plan, IPMP, Arbor Plan, Stormwater Management Plan, Stormwater Pollution Prevention Plan, ICRMP, Hazardous Waste and Integrated Solid Waste Management Plans, CERCLA/RCRA cleanup plans, Grounds Maintenance contract, AICUZ studies and any other plans that may affect natural resources, are mutually supportive and not in conflict.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	11 CES/CEIE 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/POC	John Bullough (301) 981-3162 John.bullough@us.af.mil
State and/or local regulatory POCs (For US-bases, include agency name for Sikes Act cooperating agencies)	Maryland Department of Natural Resources (MD DNR)
Total acreage managed by installation	7,407.41
Total acreage of wetlands	117.50 to 150.9 acres at Main Base Approximately 504.69 acres at Brandywine GSU 72.1 acres at Davidsonville GSU
Total acreage of forested land	706.99 Main Base 1,345 Brandywine GSU 667 Davidsonville GSU
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	No
NR 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)	❒ Invasive species ❒ Wetlands Protection Program ❒ Grounds Maintenance Contract/SOW ❒ Forest Management Program ☐ Wildland Fire Management Program ☐ Agricultural Outleasing Program ❒ Integrated Pest Management Program ❒ Bird/Wildlife Aircraft Strike Hazard (BASH) Program ❒ Coastal Zones/Marine Resources Management Program ❒ Cultural Resources Management Program

2.1 Installation Overview

2.1.1 Location and Area

JBA is located in Maryland and is within the greater Washington, D.C. metropolitan area (Figure 1). It encompasses three distinct parcels of federal land: the Main Base and two Geographically Separated Units (GSUs), the Brandywine Receiver Station and Davidsonville Transmitter Station, totaling 7,407.41 acres. Following the United States Environmental Protection Agency (USEPA) ecoregion hierarchy, JBA is located within the Chesapeake Rolling Coastal Plain ecoregion (Level IV) within the Southeastern Plains subregion (Level III, Woods et al., 2003).

The Main Base encompasses 4,903.41 acres located approximately five miles southeast of Washington, D.C. in central Prince George's County, Maryland (Figure 2). The installation is situated just outside (east) of the Capital Beltway (I-495). Areas surrounding the Base are part of the greater Washington, D.C. metropolitan area. The Main Base is bounded on two sides by Allentown Road and Marlboro Pike.

Pennsylvania Avenue (MD 4) and Suitland Parkway also border JBA to the northeast and north respectively. Suitland Parkway is managed by the National Park Service (NPS). The south end of the Main Base is bounded by Old Alexandria Ferry Road. Route 5 (Branch Avenue) forms the southwestern boundary of the Main Base. Woodyard Road (Route 223) is located south of the Main Base. The communities of Morningside, Woodyard, Clinton and Camp Springs, Maryland border the installation to the north, east, south and west, respectively. Refer to Section 2.1.4 *Surrounding Communities* for a description of the surrounding land uses around Main Base.

JBA Main Base is divided into western and eastern sections, separated by the airfield that runs north-south. The western portion of the Main Base contains the majority of the land area, including a large outdoor recreation/golf course facility, all of the community facilities, and the Medical Center. The majority of the industrial uses are located in the eastern portion of the Main Base. Both sections house mission and administrative facilities, as well as accompanied and unaccompanied housing. It has over 60 organizational units including the Army, Navy, Marines, Maryland State Police, and numerous federal agencies. The Main Base has two parallel runways, East and West Runways, and is home to Air Force One. It is the main port of entry for foreign military and government officials en route to Washington.

Distinctive physical features of the Main Base include a 14-acre lake on the south end of the Base, three interconnected ponds at Belle Chance totaling approximately 1.2 acres on the north end, and the two parallel runways covering more than 75 acres. The JLUS for JBA conducted with the Maryland-National Capital Park and Planning Commission (MNCPPC, 2009) describes the surrounding area in Prince George's County. The Main Base is surrounded by suburban residential, commercial and industrial development. Existing development is denser in general to the west and north towards Washington, D.C., while suburban development to the south is less dense. Development to the east is the least dense, where some land has been classified rural (MNCPPC, 2009). The 2017 updated AICUZ Study at JBA describes the proposed development of Westphalia to the northeast of the installation, which has been mostly undeveloped (JBA, 2017b). Westphalia is a master-planned, large-scale community that will include a mix of high-density residential development, commercial and office centers, retail, parks and trails and public facilities. Development has started, and the community will be constructed in several phases, altering future land use patterns near JBA.

The two GSU's are outlying sites for communications facilities. Brandywine Receiver Station includes 1,640 acres of mostly grassland and forest in the Brandywine community, an unincorporated area in southern Prince George's County (Figure 3). The station is approximately 6.5 miles south of the Main Base. It is bordered on the northeast by U.S. Government Railroad and to the northwest by another railroad (formerly the Pope's Creek Branch of the Pennsylvania System), and on the south by privately-owned, forested land along Mattawoman Creek located to the north of Cedarville Road. The area surrounding the Brandywine Receiver Station is composed of low residential rural land, agricultural land, and pockets of industrial land. On the east side of the station is a forested area with an approximate 230-foot overhead power line easement. There are no residential developments directly adjacent to the GSU's eastern border. North of the Station, along Brandywine Road, consists of forested land and industrial and low density residential land uses. South of the Station, along Cedarville Road, consists of forest and agricultural land use. The Cedarville State Forest is also located directly south of Cedarville Road. Neighboring communities include Wainscott, Ashbox, Cedarville, Cheltenham, and Brandywine. Refer to Section 2.1.4 *Surrounding Communities* for additional information about the surrounding land uses around the Brandywine GSU.

The Davidsonville Transmitter Station, also referred to as the Governor's Bridge GLOBECOM Annex, is 864 acres located approximately 12.5 miles northeast of the Main Base in Davidsonville, an unincorporated area in western Anne Arundel County, Maryland (Figure 4). The site is approximately 11 miles west of Annapolis and 13 miles southeast of Laurel. The Patuxent River defines the western border of the site. The

northwest and southwest sides of the site are bordered by land owned by the Maryland Department of Natural Resources (MD DNR). Three major roads surround the site, MD Route 450 (Defense Highway) to the north, MD Route 424 (Davidsonville Road) to the east, and U.S. Route 50 to the south.

Land use within South County Small Area Plan region, location of the Davidsonville Transmitter Station, is mostly rural. To the east of the Davidsonville Transmitter Station, along MD Route 424, the land is dominated by forested land, agricultural, and residential agricultural. The land to the north of the GSU consists of forested land, agriculture, and residential agricultural. South of the Station, along U.S. Route 50/301 and Rossback Rd, the land consists of forested areas, agriculture and residential agricultural. The northern section of Patuxent River Park is located directly south of the Station that spans both Anne Arundel and Prince George's Counties. Davidsonville GSU is included in a greenway along the Patuxent River. The following communities are located in the vicinity of Davidsonville Transmitter Site: Crofton, Bowie, Rutland, and Davidsonville. Refer to Section 2.1.4 *Surrounding Communities* for a further description of the surrounding land uses around the Davidsonville GSU.

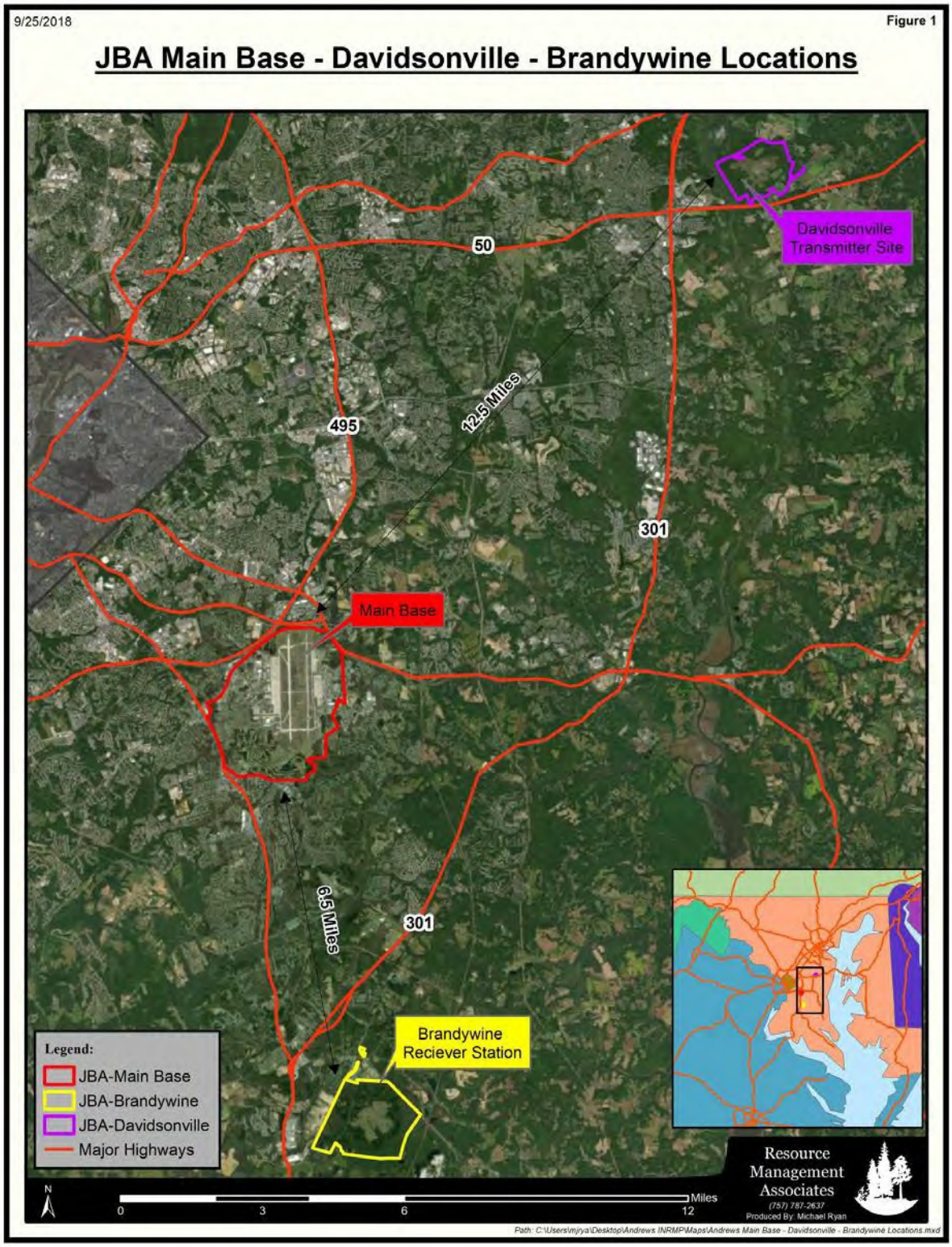

Figure 1. Location of JBA Main Base, Brandywine Receiver Station and Davidsonville Transmitter Station in Prince George's and Anne Arundel Counties, Maryland.

Figure 2. Location of JBA Main Base in Prince George's County, Maryland.

Figure 3. Location of the Brandywine Receiver Station in Prince George's County, Maryland.

Figure 4. Location of the Davidsonville Transmitter Station in Anne Arundel County, Maryland.

Table 3. Location and description of the installation and its GSUs.

Installation/GSU Location and Area Descriptions

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
JBA Main Base	• National Capital Region Defense • Home to Air Force One • Port of entry for foreign military and government officials • Malcolm Grow Medical Center	4,903.41	Yes	• Airfield incompatibility with wetlands • Bird / Aircraft Strike Hazards (BASH) • Vegetation encroachment on flight operations imaginary surfaces • Management of sensitive plant species
Brandywine Receiver Station	• Communications systems for government missions	1,640	Yes	• Bird / Aircraft Strike Hazards (BASH) • Management of sensitive plant species
Davidsonville Transmitter Station	• High frequency transmitter support to civilian and military communications	864	Yes	• Bird / Aircraft Strike Hazards (BASH) • Management of sensitive plant species

2.1.2 Installation History

Historically the land that the JBA Main Base occupies was a country estate established by a colonial land patent of 428 acres to Clement Hill in 1719, who called the estate "The Chance". Clement Hill sold 200 acres of his patent in 1721 to two other colonists, and all three established plantations where they grew tobacco and raised livestock. Prince George's County was fully settled by colonists by the mid-18th century, boasting sizeable populations along the tidal rivers of Chesapeake Bay in southern Maryland. In 1772 Clement Hill sold his "Chance" estate to the Darcy (or Darcey) family (Jamieson and Jefferson, 2001).

While the land that is now JBA did not see any military activity during the Revolutionary War, but the area did see a major campaign of the War of 1812. A British fleet with roughly 4,500 soldiers sailed up the Patuxent River in 1814, debarked near Benedict and planned a route to take Washington, D.C. About 2,000 American troops camped in Woodyard, just off the southeast corner of the Main Base and less than five miles from Belle Chance, forayed east, discovered the British outnumbered them, and retreated north, where they soon were joined by nearly 4,000 more militia to defend the nation's capital. The British troops are thought to have passed directly north of the Darcy plantation on their way to burning Washington after winning the Battle of Bladensburg, north of present-day JBA (Jamieson and Jefferson, 2001).

The Darcey family retained the "Chance" estate until 1848, increasing the plantation in the early-19th century to 272 acres. There is a Darcey family burial plot on the north end of the Main Base. In 1848 the Darceys sold the plantation to Charles F. Calvert, a direct descendant of the prominent Calvert colonial family who settled Maryland. Calvert expanded the estate to 360 acres and renamed it Belle Chance.

During the debate about slavery, the Methodist Episcopal Church South, which did not favor abolition like the Methodist General Conference, established Forest Grove Church near the Belle Chance plantation (Jamieson and Jefferson, 2001).

The history of military activity at JBA dates back to the Civil War when the Union occupied Forest Grove Church as its headquarters for soldiers camped nearby. Today, that church is known as Chapel Two, and the Base community still uses it for worship services. The Belle Chance plantation was divided among Calvert heirs in 1877, one of whom sold 168 acres containing the Belle Chance residence to Dr. William G. Stewart in 1902. Dr. Stewart was both a dentist and a lawyer, practicing in Washington, D.C. Dr. Stewart expanded his Belle Chance country estate, eventually owning land from Meadows to Camp Springs as the largest landowner in the area. In 1910 the wooden Darcey residence burned during a fire and Dr. Stewart rebuilt the home in 1912 as a fireproof, all-concrete structure that still stands today alongside three outbuildings Dr. Stewart also constructed (Jamieson and Jefferson, 2001).

During the late 1920s and early 1930s, local and national leaders decided to construct a municipal airport to serve Washington, D.C. Dr. Stewart suggested part of his land as a possible site for the new airport. Although Camp Springs was approved by the Senate for the airport, along with an express highway to connect it to downtown Washington, the House never approved the site and Washington National Airport was eventually constructed instead. Dr. Stewart continued to present site proposals and offer portions of his land to the federal government, but he was not successful until World War II broke out and the War Department needed to develop a military airfield close to Washington, D.C. (Jamieson and Jefferson, 2001). In 1941, President Franklin D. Roosevelt authorized acquisition of land to construct a military airfield on the present site of the Main Base, including all of Dr. Stewart's Belle Chance estate. In April 1943, the Camp Springs Army Air Field became operational.

The installation was renamed Andrews Field in 1945 in honor of Lt. General Frank M. Andrews, who served in numerous command roles and was killed in an aircraft accident in 1943. In 1947, with the establishment of the Air Force as a separate military service, the installation's name was modified to Andrews Air Force Base (AFB). Serving largely as a headquarters base in a curtailed operational capacity during the post-World War II years, Andrews has been the home of the Continental Air Command, Strategic Air Command and the Military Air Transport Service. Headquarters Command held command reins at Andrews from 1947 through 1952 and again after 1957. Headquarters Military Air Transport Service controlled the Base during the interim period.

With the onset of the Korean War in June 1950, Andrews rapidly became involved in combat readiness training for B-25 medium bomber crews. Combat readiness training and proficiency flying for military pilots assigned non-flying duties in the Washington area have remained two key elements in the local mission since the establishment of the Base.

However, Andrews has been best known for its special air mission--the transportation of senior government and military leaders. President Harry S. Truman was the first to fly a presidential flight out of Andrews on November 24, 1946. The port of entry and departure for dignitaries transferred to Andrews AFB in 1959 after the completion of a $14 million upgrade to the existing runway and the addition of a new parallel runway.

Andrews' air defense role was strengthened in the 1950s with the latest in fighter-interceptor hardware appearing on the flightline. F-94 Starfires, F-102 Delta Daggers and finally, F-106 Delta Darts formed the backbone of the three fighter interceptor squadrons which operated from the Base until 1963.

In the late 1950s Andrews began an annual open house and air show on Base. This event later evolved into the Department of Defense Joint Services Open House, an event that once brought more than 700,000 visitors to the Base every year. The open house is no longer held.

In the years since 1959, Andrews' flight operations and importance have increased greatly. In 1961, the last of the Military Air Transport Service's flying units at Washington National Airport transferred to Andrews. In December 1961 Naval Air Station Anacostia transferred to Andrews and formed the Naval Air Facility Washington D.C. This was followed a year later by the transfer to Andrews of all fixed-wing flying activities from Bolling AFB.

In 1962 Andrews AFB officially became the "Home of Air Force One" after President John F. Kennedy's official aircraft, a C-118, permanently transferred from Washington National Airport. In 1966 the 89th Airlift Wing ("The President's Wing") began operations at Andrews AFB. It continues to be the elite Air Mobility Command wing for transporting VIPs around the world.

In 1976, U.S. Air Force Headquarters Command was re-organized and Andrews AFB was placed under Military Airlift Command (MAC) as the 76th Airlift Division. In 1977, the 76th Airlift Division became the 76th Military Airlift Wing. The 1st Air Base Wing was re-designated as the 76th Air Base Group and the 89th Military Airlift Wing was renamed the 89th Military Airlift Group.

During Operation DESERT STORM, Andrews handled 16,540 patients in makeshift hospital facilities located in the Base tennis center.

Ultimately, with the reorganization of MAC into Air Mobility Command (AMC) in 1991, the active units at Andrews AFB were consolidated to form the 89th Airlift Wing (AW), which assumed host wing status.

In 2005 the Air Force reactivated the Air Force District of Washington (AFDW), resulting in the 2006 combination of the 89th Medical Group (Andrews AFB) and the 11th Medical Group (Bolling AFB, Washington, D.C.) into the 11th Medical Wing. Also in 2006, the 316th Wing was activated as the new host unit for Andrews AFB, and in 2007 the AFDW, as well as the 844th Communications Group, transferred from Bolling AFB to Andrews AFB.

In 2009 Andrews AFB, along with Naval Air Facility Washington, became a joint base known as Joint Base Andrews - Naval Air Facility Washington, or Joint Base Andrews. In 2010 the 316th Wing was inactivated and the 316th Wing, formerly the host wing at Bolling AFB, was re-designated the host wing at JBA.

The 316th Wing is the host wing for more than 80 separate organizations at JBA, including units from the Army, Navy, Air Force Reserve, and the Air National Guard. Table 4 summarizes the major units at JBA and their functions.

A more detailed history of JBA is presented in the ICRMP for the installation (JBA, 2014) and *Belle Chance: A Commander's Haven* (Jamieson and Jefferson, 2001).

Table 4. Major units and functions at JBA.

Major Unit	Key Functions
316th Wing (11 WG)	The 316th Wing is the host wing for Joint Base Andrews providing security, personnel, contracting, finance and infrastructure support for five Wings, three Headquarters, more than 80 tenant organizations, 148 geographically separated units, 6,500 Airmen in the Pentagon, as well as 60,000 Airmen and families in the National Capital Region (NCR) and around the world. The 316th Wing supports contingency operations in our nation's capital with immediate response rotary-assets. It also provides security for the world's highest visibility flight line and is responsible for ceremonial support with the United States Air Force Band, Honor Guard and Air Force Arlington Chaplaincy.
Naval Air Facility, Washington	Reports to the Commander Naval Air Force Reserve (CNAFR), and NOSC Washington was established to report to Region Mid-Atlantic, Reserve Component Command (RCC).
	Supports Navy and Marine Corps tenant commands with facility liaison management and Joint Base air operations.
89th Airlift Wing (89 AW)	With an Air Expeditionary Force combat-ready force of more than 1,100 personnel, the 89th Airlift Wing provides global Special Air Mission airlift, logistics, aerial port and communications for the president, vice president, cabinet members, combatant commanders and other senior military and elected leaders as tasked by the White House, Air Force chief of staff and Air Mobility Command. The 89th Airlift Wing maintains 24/7 alert, operating the Executive Airlift Training Center and Government Network Operation Center.
Air Force District of Washington (AFDW)	Air Force District of Washington is the parent command to the 316th Wing (see above), 844th Communications Group (see below), and two ceremonial elements. Air Force District of Washington falls under the command of Headquarters Air Force as a direct-reporting unit. AFDW manages Air Force resources in the National Capital Region while providing ceremonial support to HAF, the Department of Defense and the White House.
Air National Guard Readiness Center (ANGRC)	The Air National Guard's federal mission is to maintain well-trained, well-equipped units available for prompt mobilization during war and provide assistance during national emergencies (such as natural disasters or civil disturbances). During peacetime, the combat-ready units and support units are assigned to most Air Force major commands to carry out missions compatible with training, mobilization readiness, humanitarian and contingency operations such as Operation Enduring Freedom in Afghanistan.

Major Unit	Key Functions
113th Wing (District of Columbia Air National Guard [DCANG]) • 121st Fighter Squadron • 201st Airlift Squadron	The 113th Wing is the air component of the District of Columbia National Guard. As the only federal National Guard unit, its chain of command extends from the President of the United States, through the Secretary of the Army, to the Commanding General, DC National Guard. The Wing's missions include defending the National Capital Region, providing global lift for national leaders, maintaining a worldwide deployable fighter and support forces to meet expeditionary requirements, and supporting the District of Columbia and local communities during special security events, natural disasters, and other contingency operations.
459th Air Refueling Wing	The mission of the 459th Air Refueling Wing is to recruit, train and equip its Citizen Airmen to fly and maintain the KC-135 Stratotanker to help the Air Force protect its interests in air and space power. The primary missions are aerial refueling, aeromedical evacuation, and troop and cargo transport.
844 Communication Group	The 844 Communications Group provides communications-computer systems support to AFDW staff and associated organizations throughout the National Capital Region to include Headquarters United States Air Force, National Military Command Center and executive communications support for the Secretary of Defense, Chairman, Joint Chiefs of Staff and Air Force Chief of Staff.

2.1.3 Military Missions

JBA is the home of the 316th Wing and hosts more than 80 mission partners and tenant organizations to include units under the United States Air Force (Air Force), Air Force Reserve Command, Air National Guard, Air Force District of Washington, Air National Guard Readiness Center, Civil Air Patrol, United States Navy Reserve, United States Marine Corps Forces Reserve, United States Army and Defense Intelligence Agency detachments and other federal and state organizations.

Almost since its establishment, the Base has been known for its special air mission—the transportation of senior government and military leaders. However, not only does JBA provide service for America's senior officials, but also visiting kings, queens, presidents, prime ministers, popes, and local and foreign military leaders make JBA their first stop in the United States.

JBA is home to many mission partners, which include:

Air Force District of Washington (AFDW) is a direct reporting unit to Headquarters Air Force, reporting to the Chief of Staff of the Air Force. AFDW is the designated single Air Force voice for planning and implementing Air Force and joint solutions concerning the NCR. AFDW is responsible to organize, train, equip and provide forces for deployment, provide ceremonial support, and conduct homeland operations as part of a Joint effort, within the NCR. Homeland operations include homeland defense, defense support to civil authorities, emergency preparedness, and support to National Special Security Events. AFDW is the parent command to the 316th Wing, 844th Communications Group, and two ceremonial elements.

The 316th Wing (316 WG) is the host wing for JBA providing security, personnel, contracting, finance, and infrastructure support for five wings, three headquarters and over 80 tenant organizations, as well as 60,000

Airmen and families in the NCR and around the world. The 11 WG supports contingency operations in our nation's capital with immediate response rotary-assets of the 1st Helicopter Squadron (1 HS). It also provides security for the world's highest visibility flight line and is responsible for ceremonial support with the United States Air Force Band, Honor Guard and Air Force Arlington Chaplaincy.

Naval Air Facility Washington (NAFW) is one of three Navy Reserve bases and is subordinate to Commander Naval Air Force Reserve headquartered in San Diego, California. Its mission is training and readiness support for 11 Navy/Marine Corps tenant commands in order to deploy forces globally. The tenants include three operational squadrons: VR-1, VR-53, and VMR Andrews who provide very important person (VIP) transport, Navy Airlift Logistics, and Marine Corps VIP flights. Other tenants are NOSC Washington, Fleet Readiness Center (FRC) Mid-Atlantic, Navy Communication-Security Material System Command (NCMS), Information Dominance Corps Region Washington, Branch Health Clinic, Aviation Supply Depot Washington, and Fleet Logistics Center detachment NAFW. The NAFW HQ staff provides maintenance of the Navy Marine Corps Internet, communications security (COMSEC) material support, VIP hosting, facility coordination, and station weapons.

The 89th Airlift Wing (89 AW) is responsible for worldwide special air mission airlift, logistics, and communications support for the president, vice president, cabinet members, combatant commanders and other senior military and elected leaders.

The Air National Guard Readiness Center (ANGRC) provides resources, policy oversight, guidance and support to ensure 89 Air National Guard (ANG) Wings and all geographically separated units across 50 states, three territories, and the District of Columbia are trained and equipped across the full spectrum of operations (homeland and globally).

The 113th Wing ([113 WG] District of Columbia Air National Guard [DCANG]) is unique among Air National Guard units. Known as the "Capital Guardians," the wing provides air sovereignty forces to defend the nation's capital, and provides airlift and support forces capable of local, national and global employment. The 113 WG includes:

- **121st Fighter Squadron** (121 FS), a unit of 113 WG, covers a wide range of missions from flying F-16C aircraft, maintaining air sovereignty alert force readiness, organizing flying schedules, and handling equipment maintenance to managing aircrew life support responsibilities.
- **201st Airlift Squadron** (201 AS) provides short notice worldwide transportation for the Executive Branch, Congressional Members, Department of Defense officials and high-ranking U.S. and foreign dignitaries.
- Operates the **Aerospace Control Alert** (ACA) mission, a national network of fully loaded aircraft ready to protect the country on a moment's notice. The ACA mission serves as a component of the North American Aerospace Defense Command (NORAD).

The 459th Air Refueling Wing ([459 ARW] an Air Force Reserve unit) mission is to recruit, train and equip its Citizen Airmen to fly and maintain the KC-135 Stratotanker to help the Air Force protect its interests in air and space power. The primary missions are aerial refueling, aeromedical evacuation, and troop and cargo transport.

United States Army Priority Air Transport (USAPAT) provides worldwide executive airlift in support of United States Army senior leaders, DoD executives, congressional delegations and combatant commanders.

The Defense Intelligence Agency (DIA) is the main military intelligence gathering and management organization for the DoD, providing support to the warfighter and the nation.

Maryland State Police Aviation Division - The agency operates a large Aviation Command focusing on medevac operations, and also supports ground units of the state and local police. The command operates as

a multi-role helicopter unit conducting all scene-based medevac operations in the State of Maryland. In addition to medevacs, the Aviation Command provides advanced search-and-rescue services and airborne hoisting in emergency situations.

Civil Air Patrol (CAP) - Andrews Composite Squadron DC033, is part of the Civil Air Patrol National Capitol Wing. The CAP is a congressionally chartered, federally supported non-profit, corporation that serves as the official civilian auxiliary of the Air Force. It performs three congressionally assigned key missions: emergency services, which includes search and rescue (by air and ground) and disaster relief operations; aerospace education for youth and the general public; and cadet programs for teenage youth. In addition, CAP has recently been tasked with homeland security and courier service missions.

The 2017 AICUZ Study for JBA provides additional information on the host and tenant organizations at the installation along with their missions (JBA, 2017b).

In addition to the Main Base at JBA, there are two GSUs with military missions. The mission of the Brandywine Receiver Station is to provide secured high frequency radio and satellite communications service to DoD and non-DoD users in the NCR. The Davidsonville Transmitter Station has been used as an antenna farm by the 2045 Information Systems Group (2045 ISG). The 2045 ISG's mission is to provide full-time Communications links in the East Coast Gateway High Frequency Communications System. The site is part of the Defense Communications System. Davidsonville also provides air-to-ground communications networks.

Table 5 lists the major tenants at JBA and the organization responsible for managing the tenant's impact to and by natural resources.

Table 5. Major tenants at JBA and the Natural Resources (NR) responsibility for each.

Listing of Tenants and NR Responsibility

Tenant Organization	NR Responsibility
316th Wing	11 CES/CEIE
Naval Air Facility, Washington	11 CES/CEIE
89th Airlift Wing	11 CES/CEIE
Air Force District of Washington	11 CES/CEIE
Air National Guard Readiness Center	11 CES/CEIE
113th Wing DCANG • 121st Fighter Squadron • 201st Airlift Squadron	11 CES/CEIE
459th Air Refueling Wing	11 CES/CEIE
844 Communication Group	11 CES/CEIE

2.1.4 Surrounding Communities

Suburban residential, commercial, and industrial development generally surrounds the JBA Main Base. Land uses in the area are diverse, reflecting the Base's proximity to Washington, D.C. and its location in what has been a continually growing metropolitan area since the Base was established in the 1940s. Existing development is generally denser to the north and west of the Base towards Washington, D.C., with lower density suburban development to the south and the lowest densities to the east, where some land is classified as rural. Much of the land around the Base is used for residential purposes; however, large acreages are also devoted to parks, institutional uses such as schools and churches, and commercial corridors. The only

undeveloped area around the Base is to the northeast; however, much of this area is slated for a large-scale mixed-use development project (Westphalia) expected to be built out over a period of 30 years (MNCPPC, 2009).

Areas surrounding the Main Base are part of the greater Washington, D.C. metropolitan area (Figure 5). The communities of Morningside, Woodyard, Clinton and Camp Springs, Maryland border the installation to the north, east, south and west, respectively. Morningside is a small, primarily residential community located between the northeast boundary of JBA and Suitland Parkway with a 2010 population of just over 2,000 according to the U.S. Census Bureau. Woodyard is an unincorporated community along Piscataway Creek that is primarily residential and park lands. Clinton also is an unincorporated, suburban community that borders the Main Base; in 2010 the community had a rapidly growing population of nearly 36,000. Camp Springs had a population of over 19,000 in 2010 and is an unincorporated, suburban community that is growing much slower than adjacent Clinton (US Census Bureau, 2018).

JBA Main Base was originally established in a relatively undeveloped area in Prince George's County, Maryland. In recent years, additional development has occurred adjacent to Main Base, but this development has not been nearly as extensive or sprawling as that experienced by suburban counties in nearby northern Virginia. The ICEMAP (JBA, 2012) has identified urban growth as an encroachment challenge for JBA and provides additional information on that issue.

Existing land uses adjacent to Main Base are mostly residential, commercial, or industrial. Just north of JBA is the Suitland Parkway, a limited access scenic roadway that was opened on December 9, 1944, to serve as a rapid transit road between Camp Springs and Bolling Field AFB, the Pentagon and downtown Washington, D.C. The NPS manages the parkway. It is part of the National Executive Route, along which motorcades travel between JBA and Washington, D.C. Also, the Parkway is listed on the National Register of Historic Places. North of the Suitland Parkway, near the I-495/ Pennsylvania Avenue Interchange, are several commercial and industrial developments, including the Penn-Belt South Industrial Center, Penn-East Business Park, Westphalia Center, and Forestville Center. These developments fall under Accident Potential Zones I and II. On the northeast side of Main Base is the Presidential Corporate Center.

On the east side of Main Base, along Dower House Road, is an area of limited light industrial development that stretches from Pennsylvania Avenue to Piscataway Creek. Public uses in the vicinity include Melwood Elementary School, James Madison Middle School and Sherwood Forest Community Park on Rosaryville Road. To the southeast of Main Base are the Camp Springs residential community and Piscataway Creek Stream Valley Park.

South of Main Base, along Old Alexander Ferry Road, land use includes commercial and light industrial development. The Tanglewood Community Park, Tanglewood Special Education Center, Clinton Park Shopping Center, Clinton Plaza shopping center and residential development are located north of Woodyard Road in the Clinton community. To the west of Main Base, land use along Branch Avenue, from Old Alexander Ferry Road to Allentown Road is primarily residential with several commercial shopping centers and office clusters located near the intersection of Branch Avenue and Allentown Road.

The intensity of development is significantly less in the areas surrounding the GSUs. The Brandywine Receiver Station is located in southern Prince George's County in Brandywine, Maryland, and is approximately 6.5 miles directly south of JBA, Main Base (Figure 6). The area surrounding the Brandywine Receiver Station is composed of low-density residential land, agricultural land, and pockets of industrial land. Neighboring communities to the Brandywine GSU include Waldorf, Ashbox, Cedarville, and Brandywine. Waldorf is the largest community near the Brandywine GSU, to the southwest in Charles County. In 2010 Waldorf had a population of over 67,700 and is predominantly suburban. Ashbox is an unincorporated, rural community to the southeast of the GSU, located within the Baden Census Designated Place by the U.S. Census Bureau, which had a population of a little over 2,100 in 2010. Cedarville is a very small, unincorporated community near the GSU that had a population of only 717 in 2010.

Brandywine is an unincorporated, primarily rural community to the northwest of the GSU with a 2010 population of over 6,700, an increase from about 1,400 in 2000 (US Census Bureau, 2018).

The area surrounding the Brandywine GSU is composed of low residential rural land, agricultural land, and pockets of industrial land. On the east side of the station is a forested area with an approximate 230-foot overhead power line easement. There are no residential developments directly adjacent to the GSU's eastern border. The closest residential communities to the Brandywine GSU's eastern border, approximately 1.5 miles southeast of the Brandywine GSU, are Ashbox and Cedarville. North of the Station, along Brandywine Road, consists of forested land and industrial and low density residential land uses.

A privately-operated automobile junk yard is located directly north of the Brandywine GSU. Residential communities north of the junk yard and surrounding the intersection of Brandywine Road and Cherry Tree Crossing include: Holt Manor, Brandywine Forest, Early Manor, Kellers, and The Village. Also, the Cedar Point and Conrail railroads run directly adjacent to northeast and west borders, respectively, of the GSU. Directly northwest of the GSU across the Conrail railroad tracks are the low density residential communities of Brandywine Village and Brandywine Heights. Brandywine Elementary school is located within the Brandywine Village community. The land use west and southwest of the Brandywine GSU contains the Brandywine 301 and Triangle Industrial Parks and the Brandywine Commerce Center. South of the GSU, along Cedarville Road, consists of forest and agricultural land use. The Cedarville State Forest is located just south of the Brandywine GSU south of Cedarville Road. Less than one-half mile south of Brandywine GSU is the Cedarville Natural Resources Management Area, a large state-owned natural area.

The Davidsonville GSU is located in Anne Arundel County, Maryland, approximately 12.5 miles northeast of JBA, Main Base (Figure 7). Three major roads surround the site, MD Route 450 (Defense Highway) to the north, MD Route 424 (Davidsonville Road) to the east, and U.S. Route 50 to the south. The Patuxent River defines the western border of the Davidsonville GSU. The following communities are located in the vicinity of Davidsonville Transmitter Site: Crofton, Bowie, and Davidsonville. Crofton is a planned suburban residential community with industrial and commercial uses and a growing population of over 27,300 in 2010 (Anne Arundel County, 2009; US Census Bureau, 2018). Bowie is the fifth most populous city in Maryland and is located across the Patuxent River in Prince George's County from the Davidsonville GSU; Bowie had a growing population of over 54,700 in 2010 (US Census Bureau, 2018). Davidsonville is an unincorporated, agricultural and scenic rural area with a population of over 7,800 in 2010 (Anne Arundel County, 2009; US Census Bureau, 2018). Davidsonville contains a historic district on the National Register of Historic Places (Anne Arundel County, 2009).

Predominant land uses in the vicinity of the Davidsonville GSU are forested land, agricultural and residential/agricultural. The site is bordered by the Patuxent River on the west, low density residential to the north, Patuxent River Park land on the north and south, and light residential development to the east.

Land use planning in Anne Arundel County has divided the county into Small Area Plan regions. The Davidsonville GSU is located within South County Small Area Plan region, which is mostly rural. Guided by the Vision *"Keep South County Rural"* the South County Small Area Plan strives to curb growth while recognizing the need to maintain some commercial zoning to keep the area viable and livable. The intent is to encourage the use and reuse of existing commercially used land, while discouraging new commercial zoning in the South County region (Anne Arundel County, 2001). Zoning within the South County Planning Area of Anne Arundel County is predominately Residential Agriculture.

To the east of the Davidsonville GSU, along MD Route 424, the land is dominated by forested land, agricultural, and residential-agricultural. The residential community to the east is the Davidsonville Farmettes. The land to the north of the GSU consists of forested land, agriculture, and residential-agricultural. Residential communities to the north along Patuxent River Road include: Patuxent Preserve, Arrowhead Farms Estates, and Halls Grove. Other land uses north of the Davidsonville GSU and south of

MD Route 450 (Defense Highway) include the Priest Bridge Business Park and Anne Arundel County Bell Branch Athletic Complex.

Immediately west of Davidsonville GSU is the Patuxent River Park. This area is also state-owned and includes an area of former federal lands that were transferred to the state in 1984. Patuxent River Park is being developed for outdoor recreation, such as camping and canoeing, but is also known to contain rare plant species. Maryland's Greenway Initiative is a program to develop a network of greenways throughout the state. South of the Davidsonville GSU, along U.S. Route 50/301 and Rossback Road, the land consists of forested areas, agriculture and residential agricultural. The residential community to the east is Hanson Hills.

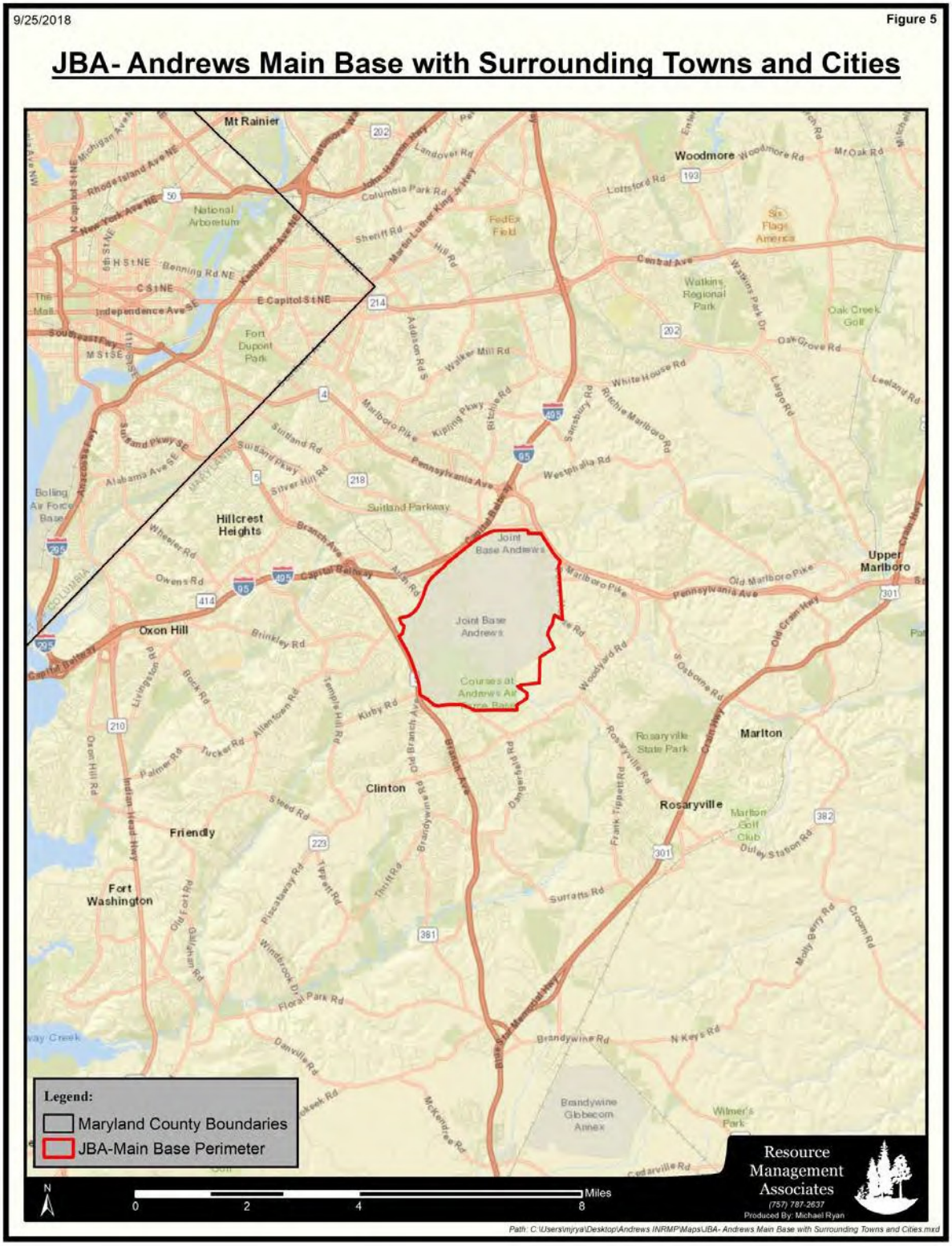

Figure 5. Location of towns and cities in Prince George's County and the District of Columbia surrounding the JBA Main Base.

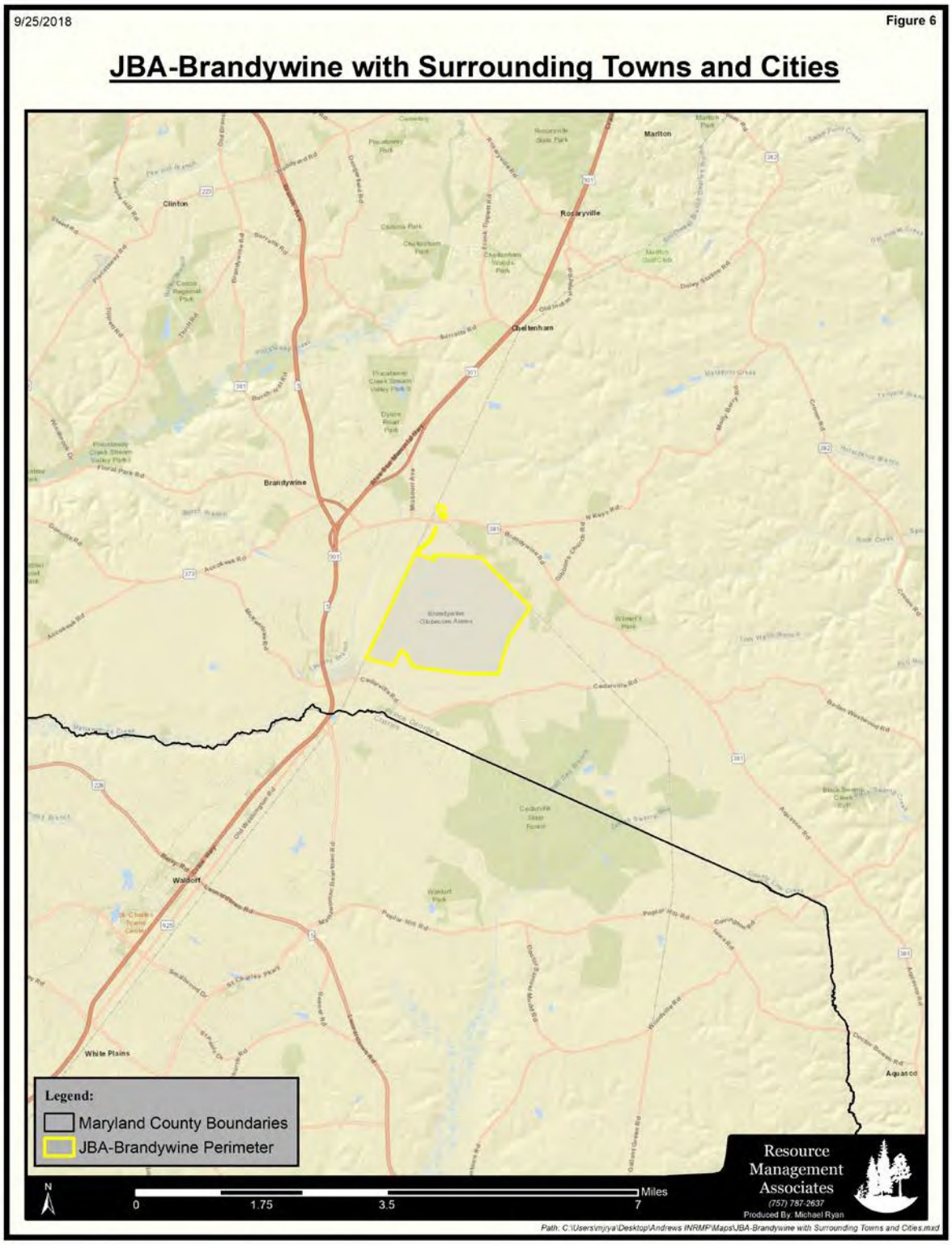

Figure 6. Location of towns and cities in Prince George's and Charles Counties surrounding the Brandywine GSU.

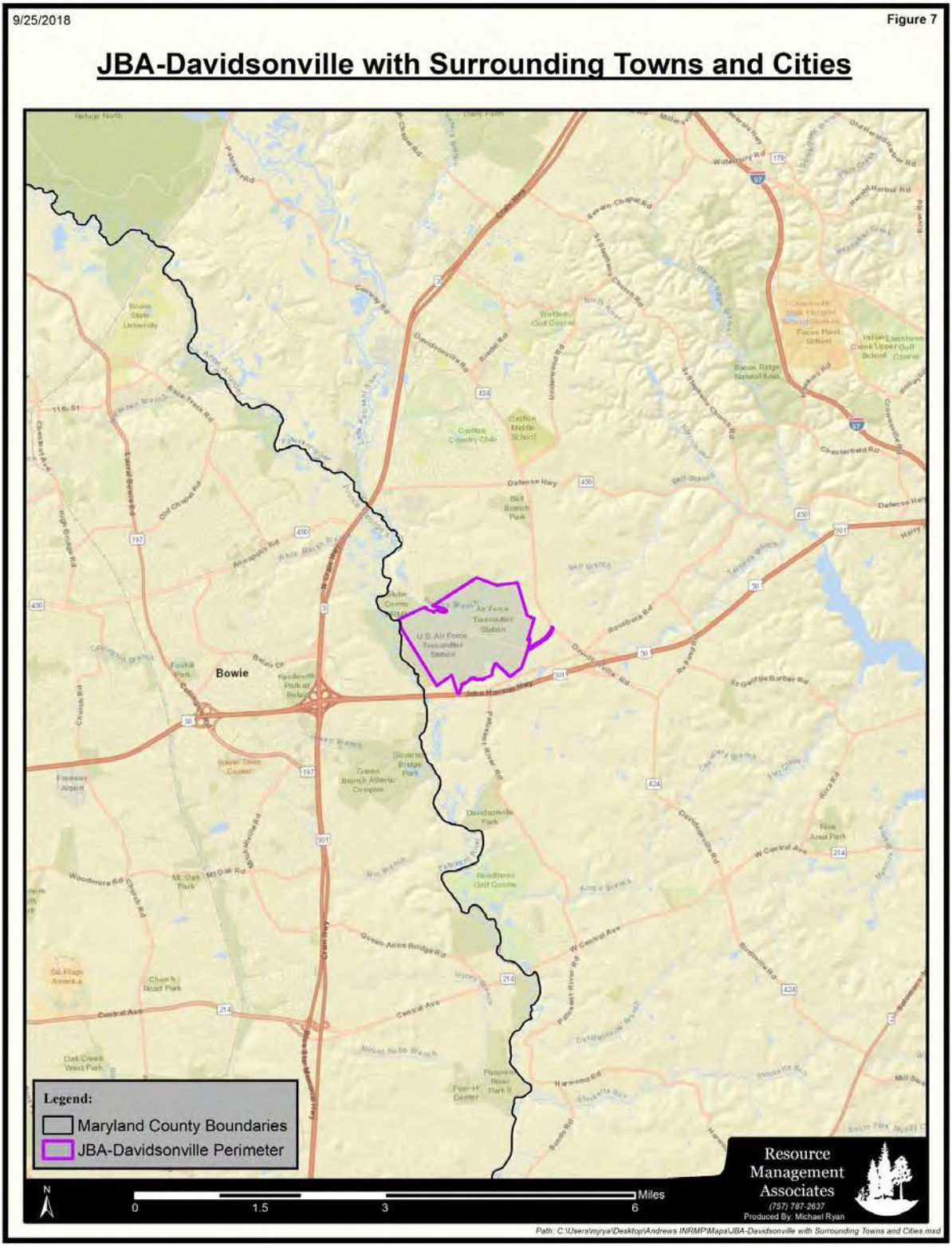

Figure 7. Location of towns and cities in Anne Arundel and Prince George's Counties surrounding the Davidsonville GSU.

2.1.5 Local and Regional Natural Areas

Although JBA is located within the greater Washington, D.C., metropolitan area, there are a number of local and regional natural areas of note within five miles of the Main Base and two GSUs. The NPS owns and manages Suitland Parkway on the north side of the Main Base (Figure 8). Suitland Parkway is a limited access scenic roadway that was opened on December 9, 1944, to serve as a rapid transit road between Camp Springs and Bolling Field AFB, the Pentagon and downtown Washington, D.C. It is part of the National Executive Route, along which motorcades travel between JBA and Washington, D.C. The National Executive Route continues onto JBA. Suitland Parkway is listed on the National Register of Historic Places and is managed by the National Capital Parks East office of the NPS.

The NPS also manages the Oxon Run Parkway, a corridor of federal park land along Oxon Run in the Washington Heights neighborhood approximately five miles northwest of the Main Base; Oxon Run is a tributary to the Potomac River. Oxon Run Parkway contains both valuable wetlands and deciduous forest habitats. One of these habitats, Sweetbay Magnolia bog, is "one of the rarest and most unique ecosystems in the region" and has been designated a Key Habitat by the District of Columbia's Wildlife Action Plan (DDOE, 2010, p. 13).

The MNCPPC owns a number of land parcels within five miles of the Main Base, including a number of neighborhood parks, playgrounds, community centers, regional parks and riparian corridors. Park lands with notable natural resources close to the Main Base include:

- Henson Creek Stream Valley Park
- Tinkers Creek Stream Valley Park
- Pea Hill Branch Stream Valley Park
- Piscataway Creek Stream Valley Park
- Charles Branch Stream Valley Park
- Western Branch Stream Valley Park
- Cabin Branch West Stream Valley Park
- Southwest Branch Stream Valley Park
- Suitland Bog Conservation Area
- Walker Mill Regional Park
- Cosca Regional Park
- Watkins Regional Park

Several of these riparian corridor parks owned by MNCPPC are located along the drainages that extend off the installation, aiding in the protection of the water quality in those watersheds draining to Chesapeake Bay. Piscataway Creek Stream Valley Park, for example, consists of several parcels of land within the Piscataway Creek riparian corridor south of the Main Base and north of the Brandywine GSU, totaling over 4,600 acres along six miles of the creek (MNCPPC, 2005). The closest of these protected parcels is less than 1.5 miles from the Main Base and contiguous to the JBA Piscataway Creek Wetland Mitigation Site.

The Suitland Bog Conservation Area protects approximately 60 acres of unique wetland habitat associated with the Magnolia Virginia Bogs, of which Suitland Bog is the only remaining bog of 30 in the Washington, D.C., region. The Suitland Bog Conservation Area contains rare and threatened plants, including several carnivorous plants (MNCPPC, 2005).

Walker Mill Regional Park includes over 500 acres of open space and woodland, with some recreational areas that have been developed. Cosca Regional Park, within five miles of both the Main Base (to the

southwest) and the Brandywine GSU (to the northwest), protects 690 acres of natural, undeveloped areas as well as developed, recreational areas, including Lake Cosca and a campground. Cosca Regional Park is contiguous with Piscataway Creek Stream Valley Park. Watkins Regional Park also allows camping and is primarily a recreational park offering an imagination playground, miniature golf, a miniature train, an antique carousel, tennis, athletic fields and picnic areas. This regional park also protects forest habitat in an area surrounded by residential development and contains the Watkins Nature Center and walking trails.

The State of Maryland owns and manages Rosaryville State Park two miles to the southwest of the Main Base and five miles northeast of the Brandywine GSU. Rosaryville State Park is a day-use park that contains a number of trails for hiking, biking and equestrians as well as the historic Mount Airy Mansion. The park protects 982 acres, predominantly forest, and allows deer bow hunting, just as JBA allows at the Brandywine and Davidsonville GSUs (see Section 7.1).

The Brandywine GSU has several natural areas within 5 miles of its perimeter (Figure 9). The MNCPPC owns a number of land parcels within five miles of the GSU, including a number of neighborhood parks, playgrounds and riparian corridors. Park lands with notable natural resources close to the Brandywine GSU include Piscataway Creek Stream Valley Park and Brandywine Road Park. Brandywine Road Park is located directly across Brandywine Road from the GSU to the northeast.

The State of Maryland owns and manages Cedarville State Forest directly south of the Brandywine GSU. Cedarville State Forest protects the headwaters of Zekiah Swamp, a 1-mile wide wooded swamp that extends south 20 miles through Charles County to the Wicomico River. The Piscataway Indian Tribe used the area in and near Cedarville State Forest as a winter camping ground. The State Forest was established in 1930 and currently owns 3,510 acres of forest. There are trails for hiking, biking and equestrian use as well as primitive equestrian camping in the State Forest. Hunting and fishing are allowed in some areas of Cedarville State Forest (MD DNR, 2018a). Cedarville Bog is a unique natural feature within the Zekiah Swamp headwaters, known for its sphagnum moss and carnivorous plants. Zekiah Swamp Run has been designated a wetland of special state concern and is considered one of the most ecologically important wetlands on the East Coast (MNCPPC, 2005).

A number of parks and refuges are along the western shoreline of the Patuxent River approximately six miles east of the Main Base and Brandywine GSU. These riparian parklands include the state-owned Merkle Wildlife Refuge, Aquasco Game Preserve, Patuxent River Management Area, Patuxent State Park, Merkle Wildlife Management Area and Patuxent River Natural Resource Management Area; plus the MNCPPC-owned Patuxent River Park and Jug Bay Complex. The Patuxent River was protected by the State of Maryland by the Patuxent River Watershed Act in 1961, recognizing the significance of its natural resources more than 50 years ago. The Patuxent River was designated a Scenic River by Maryland in 1968. The MNCPPC owns over 6,000 acres of marsh, swamps and woodland in the Patuxent River corridor, collectively known as the Patuxent River Park. The Jug Bay Complex has been designated an Important Bird Area by the National Audubon Society and contains one of the largest remaining stands of wild rice in the state. Nearby Merkle Wildlife Refuge protects nearly 2,000 acres of marsh, woodlands, fields and farm ponds, hosting the largest Canada goose wintering ground on the Chesapeake Bay's western shore (MNCPPC, 2005).

The Brandywine GSU is located within the Mattawoman Creek watershed, one of the most valuable remaining natural watersheds in the Chesapeake Bay region. Mattawoman Creek supports a number of anadromous fish and, along with the adjacent Nanjemoy Creek watershed, was "of tremendous importance to indigenous groups through history" (Suitland et al., 2015, p. 2). The NPS has identified Indigenous Cultural Landscapes within the Mattawoman and Nanjemoy Creeks watersheds that "contain some of the

most ecologically important land in the Potomac valley" (Suitland et al., 2015, p. 2). Suitland et al. (2015, p. 54) characterize the Mattawoman Creek watershed as "For current ecological health and as an example of a Chesapeake Bay watershed evoking a landscape much like the one experienced by [explorer] John Smith, the Mattawoman Creek watershed is unexcelled in the region." More descriptions of the high ecological value and natural resources of the Mattawoman Creek watershed can be found in Suitland et al. (2015).

Within five miles of the Davidsonville GSU are several important natural areas (Figure 10). The Patuxent River forms the western border of the Davidsonville GSU and the Patuxent River corridor contains a number of protected land parcels, including Patuxent State Park and Patuxent River Park. One of the protected parcels within Patuxent River Park is directly across the river from the Davidsonville GSU. The MNCPPC owns the Collington Branch Stream Valley Park to the west of the Davidsonville GSU, along with several neighborhood and community parks within five miles of the GSU. There are also several municipal parks in the area surrounding Davidsonville GSU.

Belt Woods is a hardwood forest that is one of the few remaining old-age upland forests in the Atlantic Coastal Plain, located southwest of the Davidsonville GSU. Known for its very high bird breeding density, Belt Woods is owned by the state and managed by the Western Shore Conservancy. The NPS has recognized Belt Woods as a national natural landmark (MNCPPC, 2005).

Prince George's County, through the MNCPPC, has developed a *Countywide Green Infrastructure Plan* (MNCPPC, 2005). This plan is "a comprehensive vision for conserving significant environmental ecosystems in Prince George's County" (MNCPPC, 2005, p. 2). The County identified a green infrastructure network of areas of environmental significance, including streams, wetlands, buffers, 100-year floodplains, interior forests, severe slopes, unique habitats and colonial waterbird nesting sites. Prince George's County protects wetlands, streams, 100-year floodplains, severe slopes and their associated buffers during land development. The green infrastructure network also identified conservation gaps that could provide habitat connectivity. Areas with the highest environmental sensitivity were designated Special Conservation Areas. Special Conservation Areas identified near JBA include Suitland Bog, the Patuxent River Corridor, the Jug Bay Complex, the Mattawoman Creek Stream Valley, the Cedarville State Forest / Zekiah Swamp Watershed and Belt Woods (MNCPPC, 2005).

Within and near JBA, several areas have been identified as part of Prince George's County green infrastructure network. In a 2017 update to the green infrastructure network geographic information system (GIS) dataset, Prince George's County identified areas on and directly adjacent to the Main Base as part of the countywide green infrastructure network. Within the installation, green infrastructure areas have been identified along stream drainages along every edge of the perimeter. Forested riparian areas directly adjacent to the installation are also identified as part of the network.

At the Brandywine GSU, the entire station has been identified as part of the green infrastructure network. Land directly adjacent to the entire perimeter of the GSU has also been included in the network. Near Davidsonville GSU, the Patuxent River corridor is part of the Prince George's County green infrastructure network and abuts the GSU to the west along the river (MNCPPC, 2005).

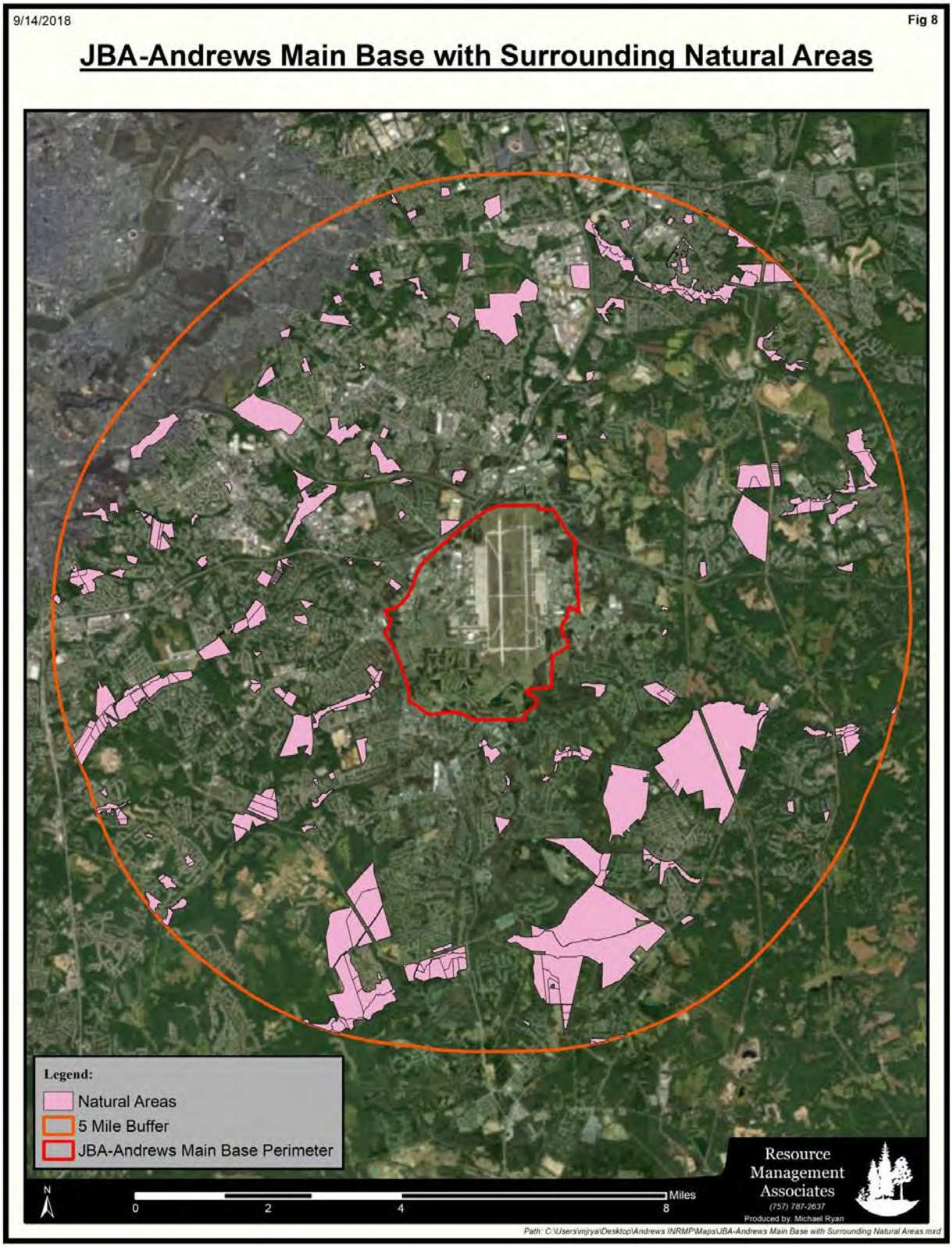

Figure 8. Natural areas within 5 miles of the JBA Main Base.

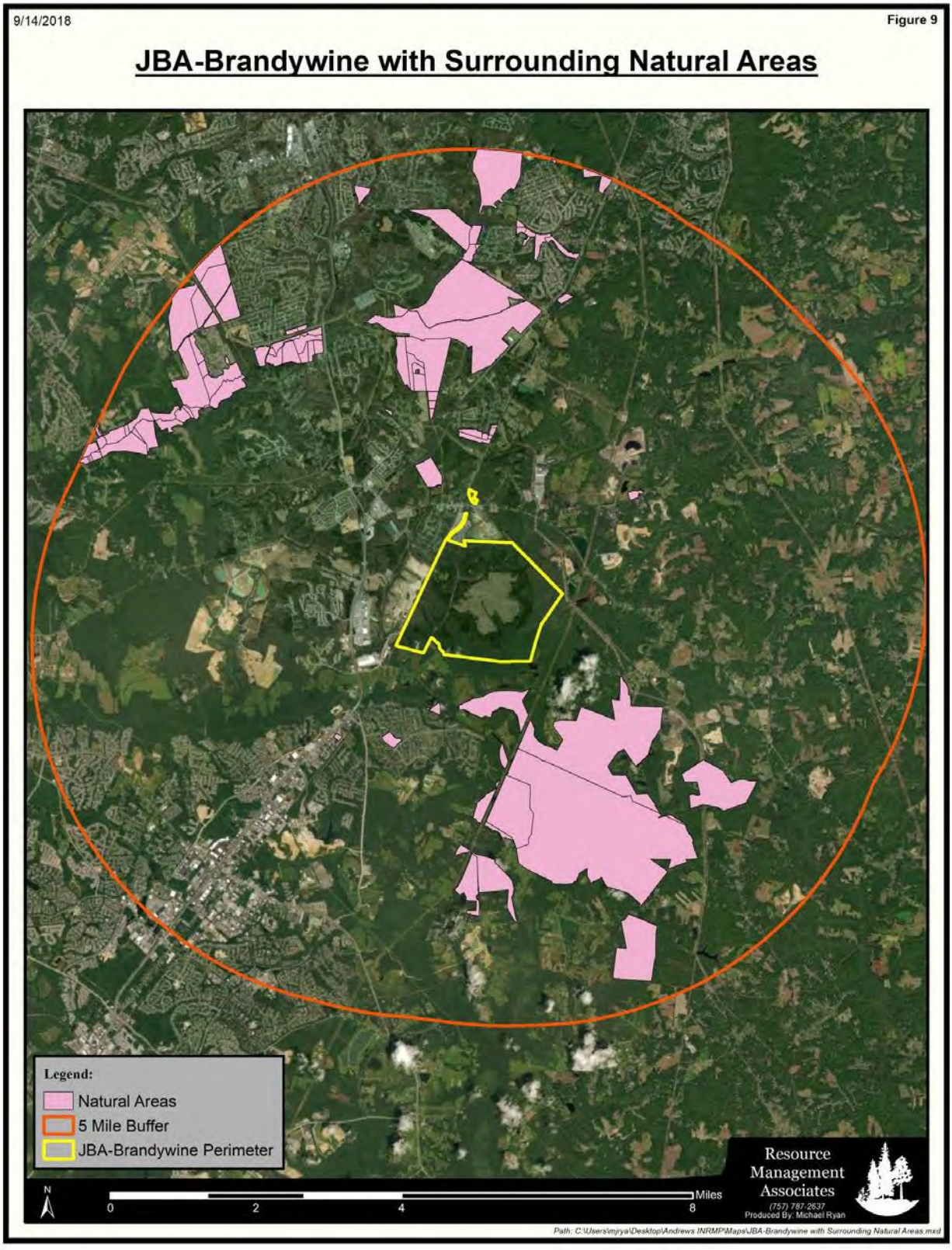

Figure 9. Natural areas within 5 miles of the Brandywine GSU.

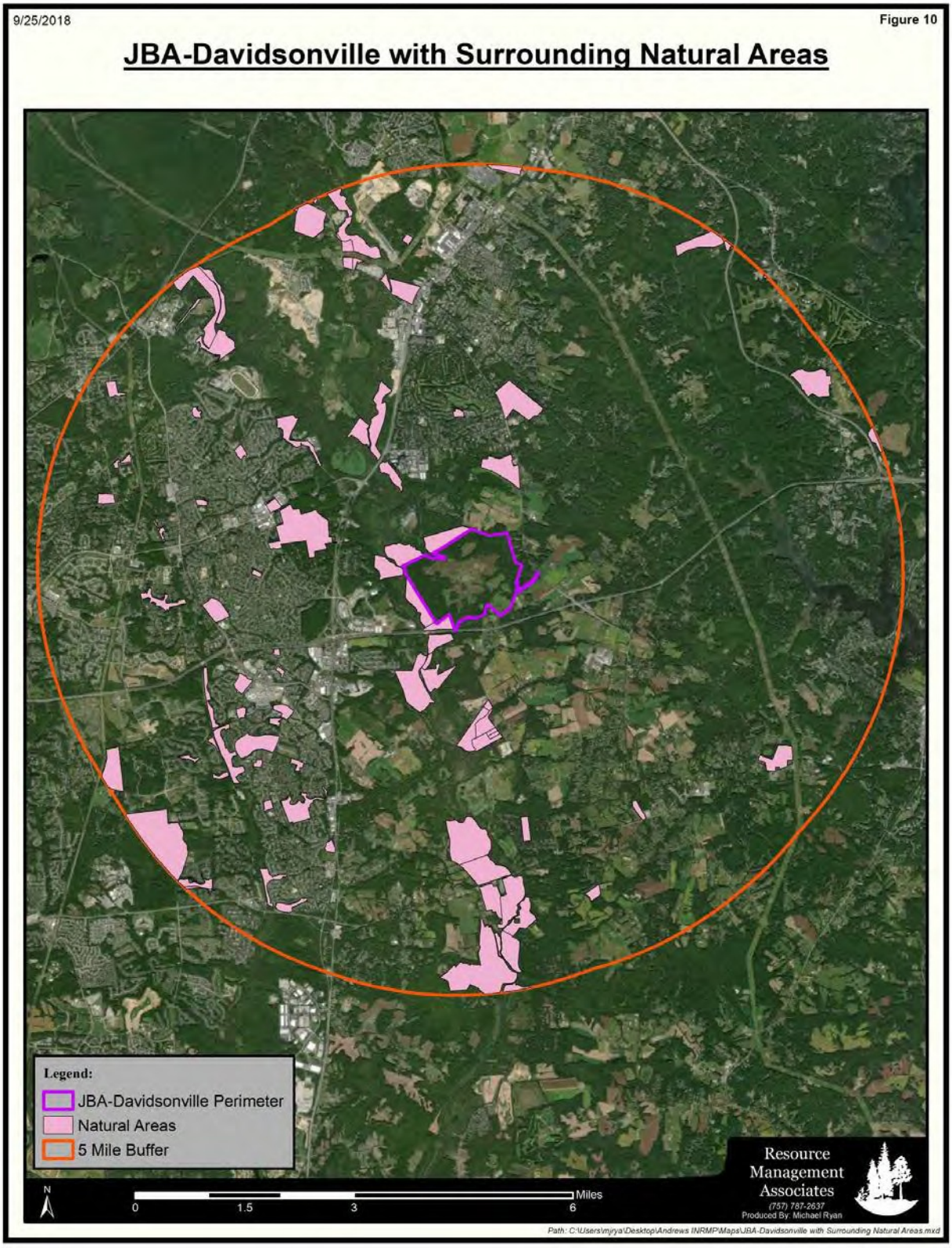

Figure 10. Natural areas within 5 miles of the Davidsonville GSU.

2.2 Physical Environment

2.2.1 Climate

JBA's geographic location near the eastern seaboard provides for a humid subtropical climate that is influenced by an easterly airflow that produces frequent successions of high and low-pressure systems. The Base is located in the Coastal Plain Province region of Maryland and typical of the Mid-Atlantic region. The Appalachian Mountains, located approximately 90 miles west of the Base, moderate the weather by dispersing moisture from the weather systems moving across them. In general, winters are cold but short, while summers are long, warm, and humid.

Winter ice storms are common in the area, which can be particularly disruptive to road travel and flight operations. Freezing rain occurs on average 4 days annually, during the months of January, February and March. These conditions are sufficiently severe to require de-icing capability at the airfield.

Table 6 shows monthly average temperatures and rainfall for JBA, based on data collected between 1943 and 2016.

Table 6. The average rainfall and temperature at JBA from 1943 to 2016.

Month	Average Rainfall (inches)	Average Temperature (°F)		
		Minimum	Maximum	Average
January	3.0	28	43	35
February	2.7	30	46	37
March	3.6	37	56	46
April	3.1	47	68	56
May	4.1	56	75	64
June	3.7	65	84	73
July	4.3	69	87	77
August	4.1	67	84	75
September	3.7	61	79	69
October	3.5	50	67	59
November	3.1	39	57	49
December	3.2	33	48	42
Total	**42.4**	**49**	**66**	**57**
Source: 89th Airlift Wing Operations Support Squadron (89 OSS/OSW), 2018.				

Tropical storms are a threat in this region during the hurricane season (June 1 to November 1). The inland location of JBA makes hurricane force winds unlikely; however, flooding rains and some wind damage typically occur in association with the passage of a tropical system. The frequency of major hurricanes (Categories 3 to 5) in the Western Atlantic has increased since the 1980s (Carter et al., 2014) and is forecast to increase more in the future (Bender et al., 2010), which may result in a continued or elevated risk of storm damages to JBA. Several studies forecast that sea level rise rates are much higher on the U.S. East Coast than the global average, which may result in an increased risk of flooding of JBA both during storm

events and in the long-term as water levels of the nearby estuarine waters continue to rise. Detailed discussions of the regionally higher rates of sea level rise can be found in Saba et al. (2016), Krasting et al. (2016) and Sallenger et al. (2012).

Winter ice storms are common in the area, which can be particularly disruptive to road travel and flight operations. Freezing rain occurs on average 4 days annually, during the months of January, February and March. These conditions are sufficiently severe to require de-icing capability at the airfield.

The average annual temperature at JBA is 57° F, ranging from a minimum of 49° F to a maximum of 66° F (Table 3). The record high temperature is 105° F and the record low is -7° F. The warmest months of the year are May through September, with average temperatures in the mid- to high-70°s and 80°s. Between 1943 and 2016 there were an average of 29 days annually that exceeded 90° F. Record highs exceed 100° F in June, July, August and September. Heat waves are forecast to increase in frequency, intensity and duration in the Mid-Atlantic in the near future (Carter et al., 2014), which would affect the number of days per year exceeding 95°F at JBA.

The coldest months of the year are December, January and February when the average annual temperature remains in the 40°s. There is an average of 82 days a year with temperatures below freezing (32° F) at JBA. Record lows below 0° F have occurred in January (-7° F) and February (-4° F), but on average there are zero days a year with temperatures below 0° F.

The average rainfall is approximately three inches per month with no true rainy season, for an annual average of 42 inches of rain (Table 3). Precipitation falls at JBA on average 169 days a year, or 11 to 16 days a month. Thunderstorms occur on average 35 days a year and have been recorded to occur during every month of the year, but most commonly during the spring and summer months. JBA has an average of 117 days annually with fog, which can disrupt flight conditions.

Between 1943 and 2016, the average annual snowfall at JBA was 19.2 inches, with snowfall recorded during every month from October to April. Snowfall totals range from a minimum of 2.8 inches in April to maximum of 31.9 inches in February. JBA averages 14 days annually with snowfall, with the majority of those days falling within the months of December, January and February. The highest daily snowfall amount between 1943 and 2016 was 19.6 inches. Recent research forecasts that the eastern U.S. may be subject to more frequent and/or intense winter snowstorms in the future (Francis and Vavrus, 2012).

The current IDP states that the Air Force must be sensitive to potential threats from the natural environment because a Base's mission can be severely impeded by climatic events (JBA, 2016a). The IDP includes climatic vulnerability as a Sustainability Development Indicator (SDI). In 2016 the SDI for Climatic Vulnerability measured JBA's vulnerability to floods high, tornadoes high, drought intensity moderate, earthquakes (seismicity) moderate, and temperature rise, precipitation pattern changes, and storm surge / intensity as low. JBA's vulnerability to sea level rise was ranked as not applicable since the installation has no estuarine or marine coastlines. Damage to infrastructure and loss of federal man-hours due to flooding and standing water conditions indicate that an investment in reducing flooding and improving flood resiliency would support military readiness. Repair and rehabilitation of the installations storm water management system can help accomplish this goal.

Future climatic vulnerability specific to JBA is difficult to predict with certainty. However, as severe weather events have shown over the years, no place is immune to severe weather events. The devastation wrought along the East Coast by a severe weather event such as Hurricane Sandy (aka, Superstorm Sandy) in 2011 demonstrates this point. These climatic vulnerability indicators show JBA should pay particular preventative attention to hazards such as flooding and seismicity. In accordance with the

ICEMAP for JBA, the installation should coordinate with local DoD installations to develop a Regional Climate Action Plan.

2.2.2 Landforms

JBA is near the western edge of the middle Atlantic Coastal Plain physiographic province with the fall line between the Piedmont and the Coastal Plain located approximately 12 miles west of the Main Base. The Blue Ridge Mountains are about 60 miles west of the Main Base, and the Chesapeake Bay is 25 miles to the east. The Coastal Plain province is primarily characterized by unconsolidated substrata. The vast majority of this area is level to gently sloping with local relief generally being less than 100 feet except for moderately steep to steep stream banks. JBA is located on a level plateau between the Anacostia River on the west and the Patuxent River on the east.

Land surface elevations at the Main Base vary from approximately 215 feet above mean sea level (AMSL) to about 281 feet AMSL. Most of the Brandywine GSU is topographically level to gently sloping, and generally slopes to the southwest. Surface elevations range from about 195 feet to 225 feet AMSL. Most of the Davidsonville GSU is also topographically level to gently sloping; slopes are much steeper on the western edge of the site near the Patuxent River. Surface elevations range from approximately 60 feet to 180 feet AMSL.

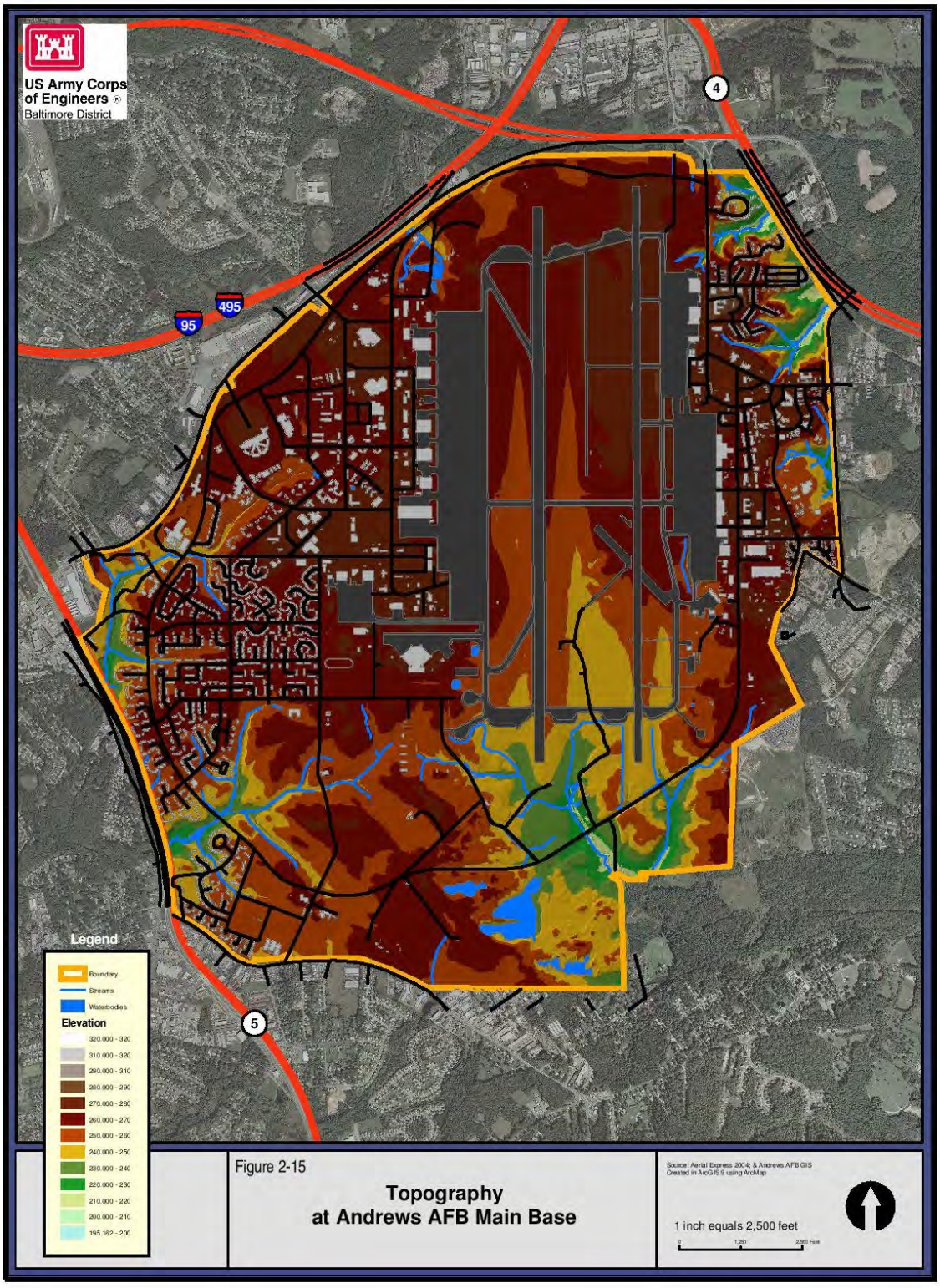

Figure 11. Topography at JBA Main Base. Figure from the 2007 INRMP (JBA, 2007).

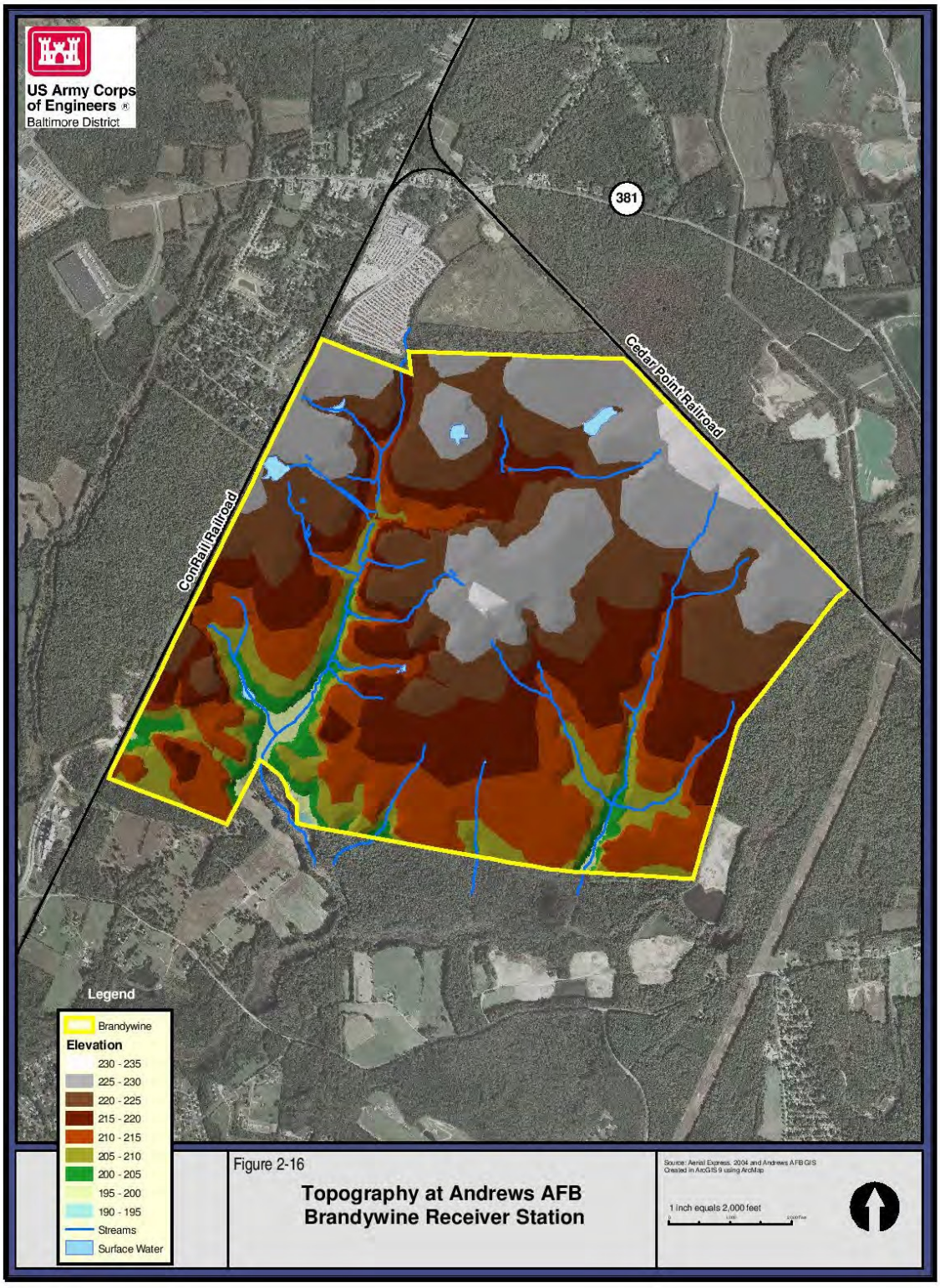

Figure 12. Topography at the Brandywine GSU. Figure from the 2007 INRMP (JBA, 2007).

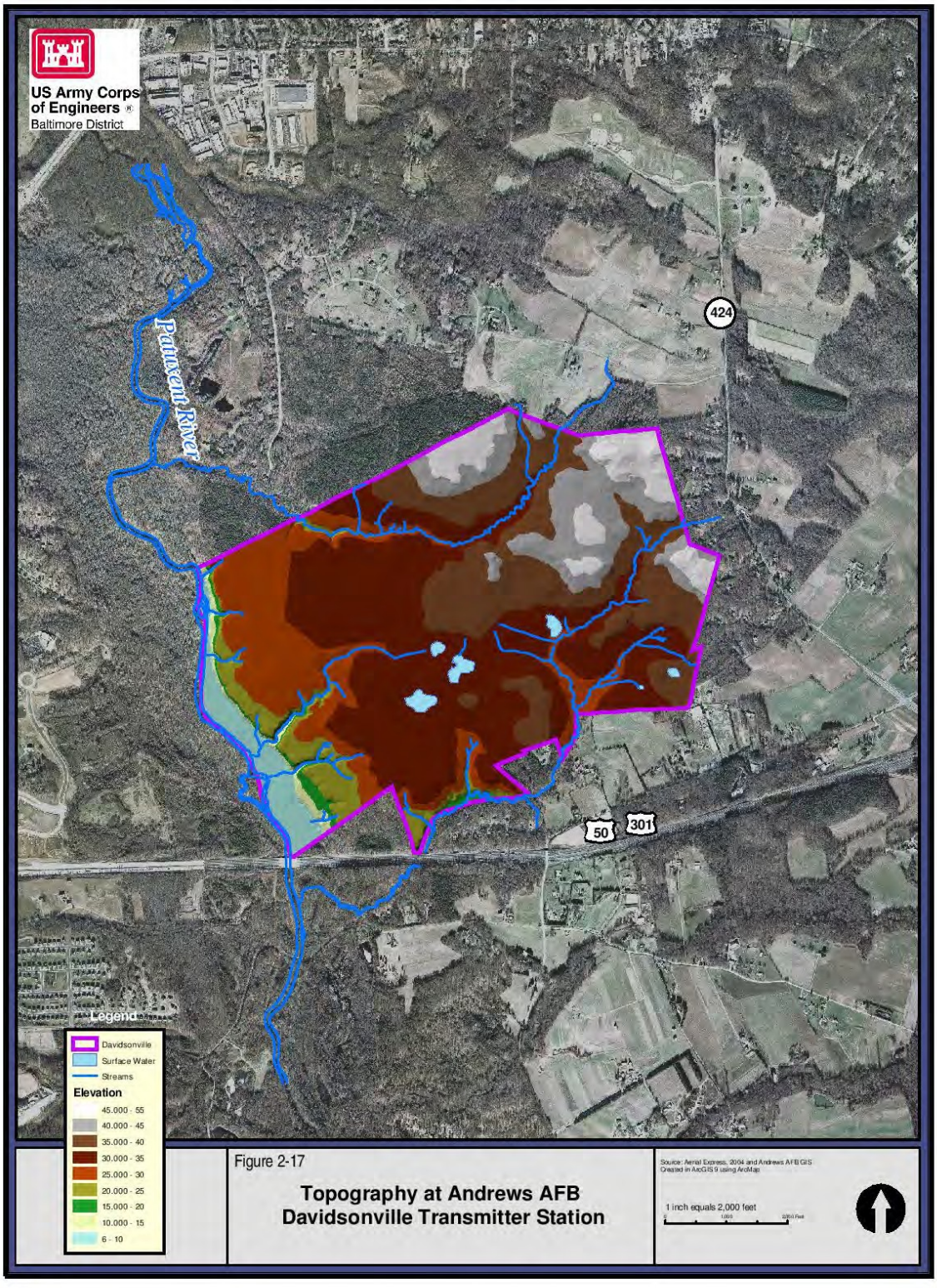

Figure 13. Topography at the Davidsonville GSU. Figure from the 2007 INRMP (JBA, 2007).

2.2.3 Geology and Soils

Much of the surficial geology at JBA is comprised of the late Tertiary Period Pliocene Epoch (about seven million years old) upland deposits. These deposits consist of irregularly bedded cobbles, gravel, and fine sand intermixed with silt or clay, and vary in thickness from 10 feet to 20 feet. The underlying Calvert Formation is visible where streams have cut deeply through the upland deposits. This formation was deposited during the Miocene Epoch, approximately 19 million years ago, and consists of a mixture of sands, silts, clays, and shell beds.

Over the course of development on the Main Base, grading for construction of runways, housing, and other facilities has disturbed surface formations. Approximately half of the Main Base is urban land, which consists of areas covered by streets, buildings, parking lots, and other structures that obscure soils and prohibit soil identification. Approximately ten percent of the Main Base remains undisturbed, mainly around the perimeter and in woodland areas among the golf courses. The two remaining dominant soil associations are the Sassafras-Croom and the Beltsville-Leonardtown-Chillum (Figure 14). These soils have been used for farming, residential, and industrial development in other portions of Prince George's County.

Table 7 identifies hydric soils and erodible soils at Main Base and the Brandywine and Davidsonville GSUs and Figures 14, 15 and 16, respectively, show their distribution on each. These soils represent potential natural resources management constraints. Hydric soils are generally characterized as either having a slow permeability or "poor to very poor" drainage class. A hydric soil is defined as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils, along with hydrophytic vegetation and wetland hydrology, are characteristics that define wetlands (USDA, 2012).

Erodible soils can present challenges for natural resources management due to their susceptibility to creation of windthrows and gullies and susceptibility to erode into streams creating turbidity, sedimentation and associated problems. Additional information on soil types at JBA can be found in the 2006 Soils Planning Level Survey, on file with the 11 CES/CEIE.

Table 7. Hydric and erodible soils at JBA Main Base, Brandywine GSU and Davidsonville GSU.

Map Symbol	Series/Phase	Hydric	Erodible	Slope (%)	Drainage Class (includes Hydrology Comments)
Main Base					
BeA*	Beltsville Fine Sandy Loam	✓		0 to 2	Moderately Well Drained (Seasonal Perched Water table; Impeded Drainage)
BeB2*	Beltsville Fine Sandy Loam, Moderately Eroded	✓	✓	2 to 5	
BeC2	Beltsville Fine Sandy Loam, Moderately Eroded		✓	5 to 10	Moderately Well Drained
B1A*	Beltsville Silt Loam	✓		0 to 2	Moderately Well Drained (Slow Permeability – Seasonally Perched

Map Symbol	Series/Phase	Hydric	Erodible	Slope (%)	Drainage Class (includes Hydrology Comments)
B1B2*	Beltsville Silt Loam, Moderately Eroded	✓	✓	2 to 5	Water Table [1.5 to 2.5 feet]; Above Fragipan – Periods of Saturation on Golf Course and Surrounding Woods)
B1C2	Beltsville Silt Loam, Moderately Eroded		✓	5 to 10	Moderately Well Drained
B1C3	Beltsville Silt Loam, Severely Eroded		✓	5 to 10	
B1D3	Beltsville Silt Loam, Severely Eroded		✓	10 to 15	
BmB	Beltsville-Urban Land Complex	✓		0 to 5	Moderately Well Drained (Slow Permeability – Seasonal Wetness; about 20% of Complex is Undisturbed Beltsville and about 20% is Disturbed Beltsville)
Bn	Bibb Sandy Loam	✓		0 to 2	Poorly Drained (Slow to Very Slow Permeability – Seasonal Perched Water Table [1.5 to 2.5 feet] Above Fragipan; Ponding-Seasonal Wetness)
Bo	Bibb Silt Loam	✓		0 to 2	Poorly Drained (Seasonal High Water Table [0 to 1 feet]; Flood Hazard; Poor Drainage Recent Alluvium on Floodplains; Drainage to Piscataway Creek South of Runways)
Fs	Fallsington Sandy Loam	✓		0 to 2	Poorly Drained (Moderately Permeable Ponding-Water Table at or Near Surface for Long Periods Low-Lying Areas)
HoB2	Howell Fine Sandy Loam, Moderately Eroded		✓	2 to 6	Well Drained
HwC2	Howell Silt Loam, Moderately Eroded		✓	6 to 12	Well Drained
Ik	Iuka Fine Sandy Loam	✓		0 to 2	Moderately Well Drained (Moderately Permeable – Seasonal High Water Table [1 to 3 feet] – Flood Hazard; Some Poorly Drained Inclusions [Series not Given]; On Floodplains and Along Major Streams, Flood Drainage 2 to 7 Days
LeA*	Leonardtown Silt Loam	✓		0 to 2	Poorly Drained (Slow to Very Slow Permeability – Perched Water Table [0

Map Symbol	Series/Phase	Hydric	Erodible	Slope (%)	Drainage Class (includes Hydrology Comments)
LeB*	Leonardtown Silt Loam	✓		2 to 5	to 1 feet]; Above Fragipan-Ponding-Long Periods of Wetness; Three Main Areas on Base: Wooded Area Near Main Gate; Between Runways at NE End; Woods on Perimeter Road Near Gas Storage
MnB2	Matapeake Silt Loam, Moderately Eroded		✓	2 to 5	Well Drained
MnC2	Matapeake Silt Loam, Moderately Eroded		✓	5 to 10	
MrA	Matawan Fine Sandy Loam	✓		0 to 2	Moderately Well Drained (Slow to Very Slow Permeability; Seasonal Wetness in and around the Golf Course)
MrB2	Matawan Fine Sandy Loam, Moderately Eroded		✓	2 to 5	Moderately Well Drained
MrC2	Matawan Fine Sandy Loam, Moderately Eroded		✓	5 to 10	
MuA	Mattapex Silt Loam	✓		0 to 2	Moderately Well Drained (Seasonal High Water Table [1.5 to 2.5 feet]; Mostly Wooded)
MuB2	Mattapex Silt Loam, Moderately Eroded		✓	2 to 5	Moderately Well Drained
RdA	Rumsford Loamy Sand	✓		0 to 2	Well Drained (Slow Runoff Due to Slopes of 0 to 5 percent)
RdB2	Rumsford Loamy Sand		✓	2 to 5	Well Drained
RdC2	Rumsford Loamy Sand		✓	5 to 10	
RdC3	Rumsford Loamy Sand		✓	5 to 10	
RdD2	Rumsford Loamy Sand		✓	10 to 15	
SgB2	Sassafras Gravelly Sandy Loam, Moderately Eroded		✓	2 to 5	Well Drained
WaC2	Westphalia Fine Sandy Loam, Moderately Eroded		✓	6 to 12	Well Drained
WoA	Woodstown Sandy Loam	✓		0 to 2	Moderately Well Drained (Seasonal High Water Table and Wetness)

Map Symbol	Series/Phase	Hydric	Erodible	Slope (%)	Drainage Class (includes Hydrology Comments)
WoB2	Woodstown Sandy Loam, Moderately Eroded		✓	2 to 5	Well Drained
WoC2	Woodstown Sandy Loam, Moderately Eroded		✓	5 to 10	
Brandywine Receiver Station					
Bo	Bibb Silt Loam	✓		0 to 2	Poorly Drained
B1C2	Beltsville Silt Loam, Moderately Eroded		✓	5 to 10	Moderately Well Drained
B1C3	Beltsville Silt Loam, Severely Eroded		✓	5 to 10	
C1B2	Colemantown Loam, Moderately Eroded	✓	✓	3 to 8	Poorly Drained
C1C3	Colemantown Loam, Severely Eroded	✓	✓	8 to 15	
CsC3	Croom Gravelly Loam, Severely Eroded		✓	8 to 15	Well Drained
CtB2	Croom Gravelly Sandy Loam,		✓	3 to 8	Well Drained
CtC3	Croom Gravelly Sandy Loam, Severely Eroded		✓	8 to 15	
Ek	Elkton Silt Loam	✓		0 to 2	Poorly Drained
LeA	Leonardtown Silt Loam	✓		0 to 2	Poorly Drained
LeB	Leonardtown Silt Loam	✓		2 to 5	
SgC2	Sassafrass Gravelly Sandy Loam, Moderately Eroded		✓	5 to 10	Moderately Well Drained
ShB2	Sassafrass Sandy Loam, Moderately Eroded		✓	2 to 5	Well Drained
Davidsonville Transmitter Station					
FaA	Fallsington Sandy Loam	✓		0 to 5	Poorly Drained

Map Symbol	Series/Phase	Hydric	Erodible	Slope (%)	Drainage Class (includes Hydrology Comments)
SaB2	Sassafras Fine Sandy Loam, Moderately Eroded		✓	2 to 5	Well Drained
WBA	Widewater and Issue Soils, Frequently Flooded	✓		0 to 2	Somewhat Poorly Drained
*Soils with hydric inclusions					

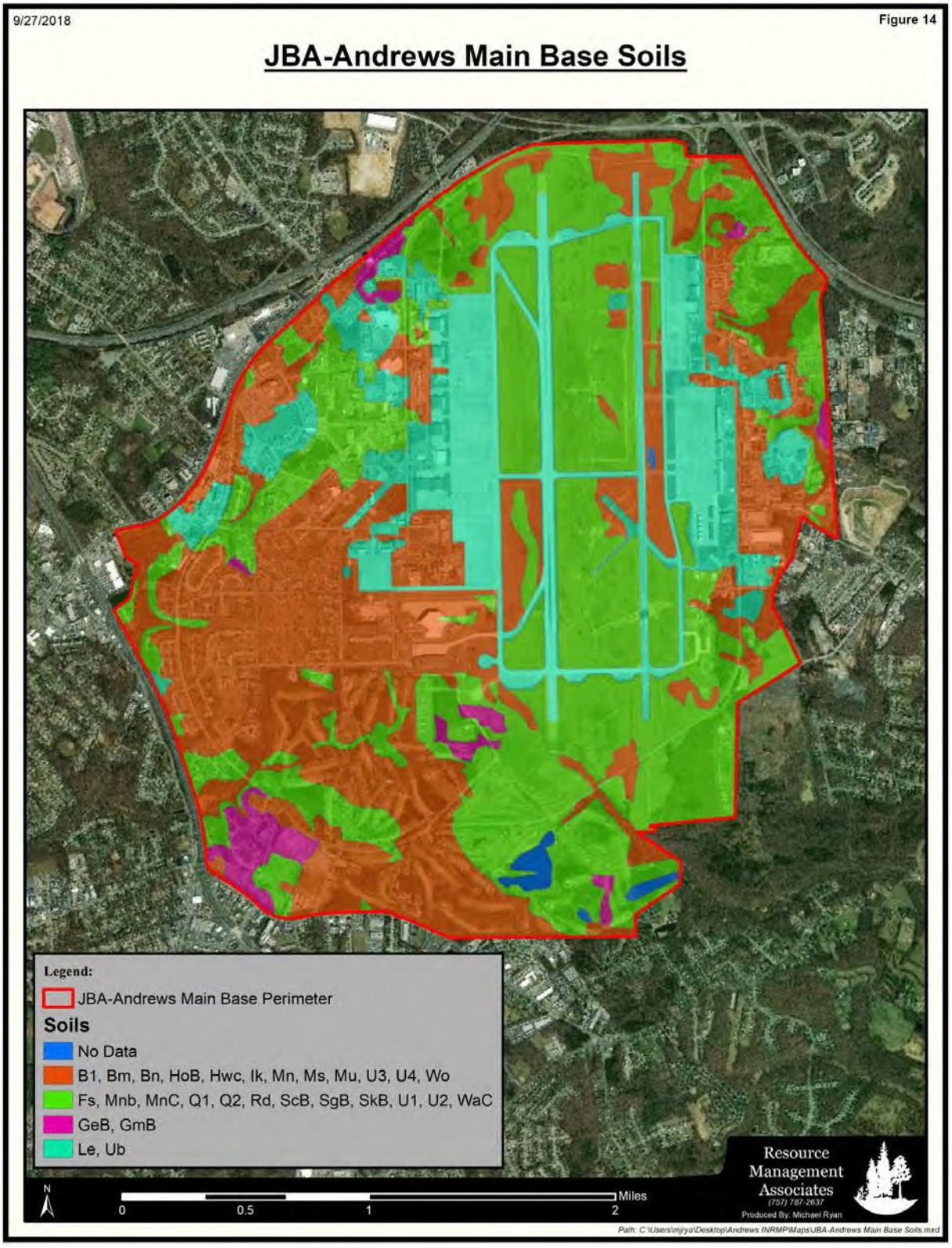

Figure 14. Soil types and locations at JBA Main Base.

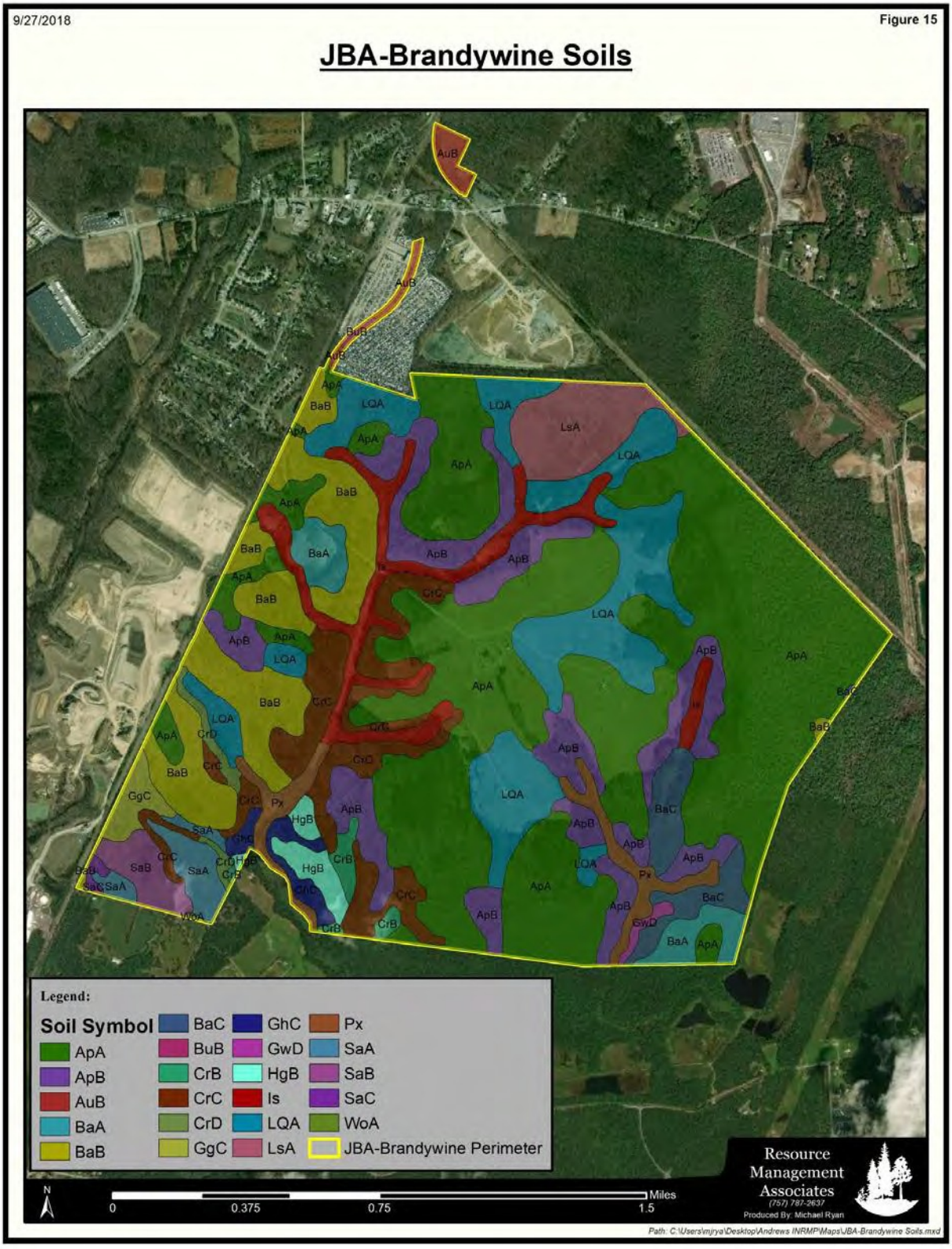

Figure 15. Soil types and locations at the Brandywine GSU.

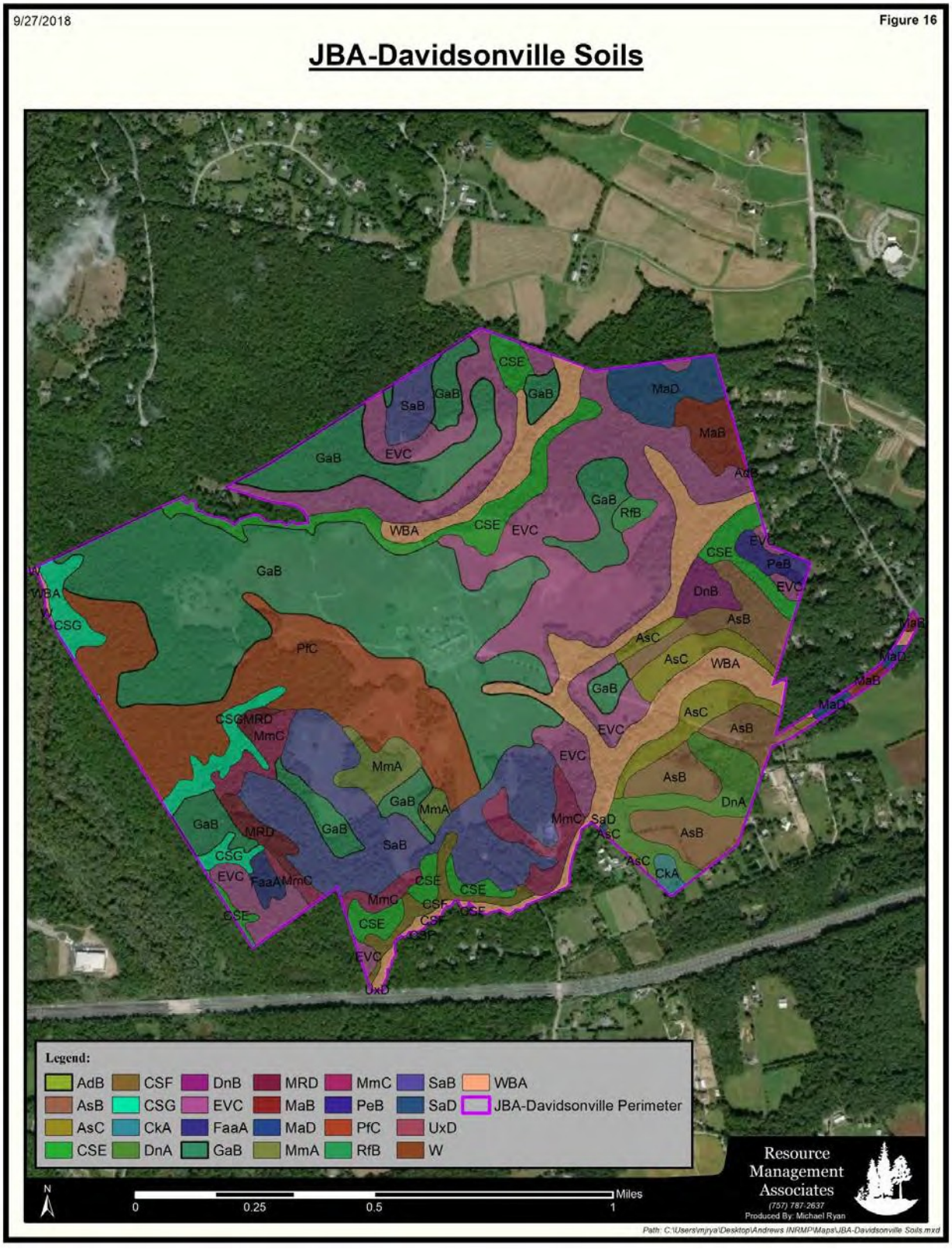

Figure 16. Soil types and locations at the Davidsonville GSU.

2.2.4 Hydrology

2.2.4.1 Surface Water

JBA is located within multiple sub-basins in the Mid-Atlantic Region (USGS, 2012). JBA and its surrounding areas are located within three diverse watersheds (Potomac, Anacostia, and Patuxent) that drain approximately 2,317 square miles of the east-central portion of the Chesapeake Bay Basin (Figure 17). The Patuxent River watershed drains approximately 158,000 acres of the eastern portion of Prince George's County, while 132,000 acres drain to the Anacostia River (west of JBA). Most of Main Base and the Brandywine GSU are in the Potomac River Sub-Region (Hydrologic Unit Code [HUC] 0207), while the eastern edge of Main Base and the Davidsonville GSU are in the Upper Chesapeake Sub-Region (HUC 0206).

The uplands that characterize the topography of the Main Base create a watershed divide, with the western portion of the Base generally draining to the Potomac River (HUC 02070010) and the eastern portion generally draining to the Patuxent River (HUC 02060006), which is located approximately seven miles east of the Main Base (Figure 18). Several major tributaries to the Potomac River that are fed by a shallow, unconfined surface aquifer originate on or near the Main Base. Piscataway Creek (HUC 020700100305) originates in the southeast corner of JBA and flows through primarily forested and agricultural lands before it discharges to the Potomac River. The headwaters of Tinkers Creek (HUC 020700100304) [Meetinghouse Branch and Paynes Branch] lie near the southwest corner of the Base. Tinkers Creek flows through highly forested areas as it nears its confluence with Piscataway Creek. Henson Creek (HUC 020700100303) is located northwest of JBA and flows through predominantly forested areas before it discharges into Broad Creek. Cabin Creek and the Charles Branch (HUC 020600060304) originate in the northeastern quadrant of the Main Base and drain toward the east to Western Branch, which eventually flows into the Patuxent River.

Surface water resources at Main Base also include Base Lake (Freedom Lake) in the southwest corner of the site, three ponds in the northwest portion of the Base, and two other small ponds at the South Golf Course (Figure 18).

The Brandywine GSU is located entirely in the Piney Branch - Mattawoman Creek Watershed (HUC 020700110101), mostly within the Upper Mattawoman sub-watershed, with a very small portion within the Timothy Branch sub-watershed. Two unnamed tributaries on the site flow into Mattawoman Creek. The Upper Mattawoman sub-watershed represents a typical headwater system with relatively small steams and floodplains (USACE, 2006). There are approximately 9.7 linear miles of open watercourses that drain surface water from the site southward to four natural outfalls (Figure 19). These outfalls feed into unnamed intermittent streams that flow into Mattawoman Creek. A significantly sized pond exists on both sides of Air Force Road in the northwestern portion of the site. This pond is created by a combination of the road crossing and heavy beaver activity.

The Davidsonville GSU is bordered to the west by the Patuxent River, which receives all of the drainage from the site from two streams within the Stocketts Run-Patuxent River watershed (HUC 020600060402). The Patuxent River has been designated as a State Scenic and Wild River. Roughly half of the site is located within an unnamed tributary sub-watershed to the Patuxent River, while the other half lies within the Roper's Branch sub-watershed. The unnamed tributary is located in the southeastern section of the station; it flows south off the site, then southwest to the Patuxent River. Roper's Branch is located within the northern section of the site and flows west to the Patuxent River. These streams originate from springs discharging from an unconfined shallow surface aquifer. There are approximately 19 linear miles of watercourses that convey surface and stormwater runoff on or adjacent to the Davidsonville GSU (Figure 20). There are no water bodies on the Davidsonville GSU.

Chesapeake Bay has been designated an impaired water body by the United States Environmental Protection Agency (USEPA). The Chesapeake Bay Program is a regional partnership established in 1983 among federal and state agencies, local governments, academic institutions and non-profit organizations. The DoD is one of the federal partners in the Chesapeake Bay Program. In 2014 the program partners signed the Chesapeake Bay Watershed Agreement that established goals, outcomes and management strategies to guide restoration of the Chesapeake Bay, its tributaries and surrounding lands. The Chesapeake Bay Action Team collects and publishes annual DoD and watershed information.

In 2010, the USEPA established total maximum daily loads (TMDLs) for nitrogen, phosphorus and sediment in the Chesapeake Bay to improve water quality in the Bay under the Clean Water Act (CWA). The USEPA and the Maryland Department of the Environment (MDE) have approved a series of TMDLs for nutrients (nitrogen and phosphorous), bacteria, suspended sediments, impacts to biological communities, and other pollutants in specific watersheds draining into Chesapeake Bay, including those on JBA (MDE, 2018a). JBA is entirely within the Chesapeake Bay watershed and is subject to the water quality standards set for Maryland's watersheds. The current status of TMDLs for the Maryland watersheds within the Chesapeake Bay watershed can be found on the MDE website https://mde.maryland.gov/programs/Water/TMDL/Pages/sumittals_a-l.aspx.

All of the watersheds at JBA have been designated as impaired and/or within TMDL management for water quality under Section 303(d) of the Clean Water Act by MDE for 1st through 4th order streams (MDE, 2012a, 2018a). The JBA Main Base is within seven MD DNR 12-digit watersheds for TMDL management: 021402010797 within the Potomac River Upper Tidal watershed; 021311030919 within the Western Branch of the Patuxent River watershed; 021311020912 within the Patuxent River Middle watershed; and 021402030800, 021402030802, 021402030803 and 021402030804 within the Piscataway Creek watershed.

The Potomac River Upper Tidal watershed (MDE 8-digit watershed 02140201) was identified as impaired in Maryland's 1996 303(d) list for copper, nutrients and suspended sediments; impairments for polychlorinated biphenyl (PCBs) and impacts to biological communities were identified in 2002 and 2004 respectively (MDE, 2018b). The Western Branch of the Patuxent River watershed (MDE 8-digit watershed 02131103) has been identified as impaired for nutrients and suspended sediment (MDE, 2018c). The Patuxent River Middle watershed (MDE 8-digit watershed 02140203) was identified as impaired for multiple pollutants in 2016 (MDE, 2018d). Impairments for the Piscataway Creek watershed (MDE 8-digit watershed 02140203) have been identified for nutrients (1996), sediments (1996), bacteria (2002) and impacts to biological communities (2004) and have been proposed for PCBs (MDE, 2018a, e).

Impairments for the Mattawoman Creek watershed (MDE 8-digit watershed 02140111) have been identified for nutrients (nitrogen and phosphorous) and have been proposed for PCBs (MDE, 2018f). The Brandywine GSU is located within two Mattawoman Creek sub-watersheds designated as MD DNR 12-digit watersheds 0201401110787 and 021401110788 for TMDL management. The Patuxent River Upper watershed (MDE 8-digit watershed 02131104) has been identified impaired for nutrients (1996), sediments (1996) and impacts to biological communities (2002), although MDE anticipates removing the nutrients listing when the 303(d) list is revised (MDE, 2018g). The Davidsonville GSU is located within the MD DNR 12-digit watershed 021311040935 within the Patuxent River Upper watershed for TMDL management.

The quality of the body of water receiving installation stormwater is an important indicator for Base sustainability. The JBA stormwater system of catch basins and culverts guide water through a series of natural drainage channels, underground storm sewer pipes, and man-made ditches. JBA has eight watersheds that discharge at the Main Base boundaries with the majority of stormwater (90%) leaving the Base draining to tributaries that ultimately outfall to the Potomac River. The remaining stormwater drains

to tributaries that ultimately outfall to the Patuxent River. JBA holds a National Pollutant Discharge Elimination System (NPDES) permit to measure stormwater quality discharged from the installation. However, MDE does not require results of samples due to agreed use of best management practices (BMPs) by the installation. Stormwater is discharged into Piscataway Creek – a receiving body that is degraded, but the degradation does not affect the installation's current ability to discharge based on its permit limits and other regulatory direction. That stated, the JBA Natural Infrastructure Assessment from 2009 predicts the water body receiving stormwater will deteriorate in the future. If stricter regulations from the USEPA are imposed on Piscataway Creek, permitted discharge levels may decrease, resulting in tighter restricts on JBA's ability to discharge wastewater (JBA, 2016a).

JBA Main Base has approximately 1,040 acres of drainage ditches that are maintained with a mowing height not to exceed eight inches by the grounds maintenance service contractor. There are approximately 1.28 acres of bio-retention ponds on the Main Base that filter stormwater and are mowed by the grounds maintenance service contractor. In 2015 JBA repaired the airfield storm drainage system at multiple locations on the airfield, a program that is ongoing. An assessment of JBA's airfield storm drainage system conducted in 2010 revealed numerous failing or inadequate system elements that caused ponding on runways and taxiways, resulting in unsafe conditions. The condition of the airfield storm drainage system at that time impaired JBA's ability to successfully meet its NPDES permit conditions and comply with state and federal water quality regulations. As a result, JBA repaired approximately 51,000 linear feet of storm sewer pipe and 122 manholes of the airfield stormwater drainage network (JBA, 2015c). The Stormwater Management Plan (JBA, 2017a) and Stormwater Pollution Prevention Plan (JBA, 2015ba for JBA describe the installation's control measures and BMPs for stormwater management, as well as the impairments for each of the JBA watersheds, in detail.

JBA pursues low impact design (LID) in projects as well as observes Maryland stormwater regulations. For example, JBA has installed a green roof on the Jones Building, installed a rain garden outside Building 3466, and implemented some pervious pavement at Heritage Park, overflow parking areas and some pedestrian walkways. The Base has also pursued an urban eco-stream retrofit project along Meetinghouse Creek near the hospital to better manage stormwater runoff. In the future the Base will also have to upgrade existing stormwater ponds and start retrofitting parking lots with pervious pavement, bio-swales and other LID strategies. Design work to repair many of the stormwater ponds was initiated in FY2014. Cumulatively these efforts should help reduce stormwater runoff and assist with the quality of stormwater runoff that feeds into a receiving body of water (JBA, 2016a).

2.2.4.2 Groundwater

JBA is located within a portion of the Maryland Coastal Plain that includes several important regional water supply aquifers. These aquifers are located several hundred feet below ground surface (bgs), and include, in order of descending stratigraphic sequence, the Aquia, Magothy, Patapsco, and Patuxent formations. The Aquia formation, located at a depth of 150 feet bgs, is a primary source of groundwater for Prince George's, Anne Arundel, Charles, and St. Mary's counties, and is primarily recharged by infiltration in an area northwest of the Main Base. The underlying Patapsco and Patuxent aquifers supply groundwater to consumers in Prince George's, Anne Arundel, and Charles counties.

Groundwater underlying the Main Base occurs at or near the ground surface, with shallow groundwater occurring at depths of less than 20 feet bgs, likely under unconfined conditions. Groundwater recharge occurs primarily through precipitation. Groundwater flow is believed to be down-gradient toward local streams or downward toward deeper underlying aquifers. Similar groundwater conditions exist at the Brandywine and Davidsonville sites.

Potable water supply on the Main Base is provided by Washington Suburban Sanitary Commission (WSSC) (Infinity Technology and PBS&J, 2010). WSSC receives its water supply entirely from the Potomac River,

then treats the water at the WSSC Potomac Water Treatment Plant before distribution. There are two non-potable water supply wells for the golf courses at Main Base. One of the wells was completed in the Magothy Formation at a depth of about 385 feet bgs, while the second well was completed in the Patapsco Formation at a depth of about 650 feet bgs. There is one water supply well each at Brandywine and Davidsonville.

The JBA IDP assessed the Base's water supply capacity in 2016 (JBA, 2016a). The average daily demand for water on Base, not including the housing area, was 677,885 gallons per day (gpd). The water supply capacity from WSSC averages 1,733,930 gpd, indicating that the Base utilizes 40.19% of the average daily capacity. During peak demand periods, the Base averages water use of 57.05% of the water supply capacity from WSSC. JBA's water distribution system on Base was privatized in February 2006 with Terrapin Utility Services, Inc., under a 50-year contract. Terrapin Utility Services, Inc., provides potable water storage for JBA. The SDI for water supply capacity was rated Meeting or Exceeding in the JBA IDP. Using FY2007 baseline data, JBA reduced its potable water intensity use by 31% in FY2015, exceeding the Base goal of 16%. JBA observes leadership in energy and environmental design (LEED) standards for projects which encourage the inclusion of water conservation features in facility design, which should further reduce water usage and preserve the existing capacity. JBA has capacity to expand existing missions and to accept new missions under the known average water supply demand and peak demand conditions (JBA, 2016a).

The quality of drinking water used by an installation is an important indicator for Base sustainability. JBA's drinking water quality meets primary and secondary drinking water standards. There are no contaminants in the water that require additional treatment. The water supply quality measure assessed in the IDP received the highest attainable rating for current and future water quality standards. However, the majority of the Base's distribution system is approximately 60 years old and consists of direct buried water mains and lines of various sizes and materials. Concern has been expressed over tuberculation in the water piping network which degrades water quality and can impact the health and well-being of Base personnel. The IDP also found that stakeholders expressed concern about water quality and the condition of the water distribution system. The replacement of aging and deteriorating piping is necessary and Terrapin Utility Services, Inc., plans to replace all waterlines on the Base as part of its privatization contract. The replacement of water system piping on JBA should help improve the system's reliability and resolve any reported issues related to tuberculation and water quality (JBA, 2016a).

The wastewater collection system at JBA was privatized in February 2006 and is owned and operated by Terrapin Utility Services, Inc. The Main Base's wastewater collection system consists of two independent collection systems – one on the east and one on the west – that convey wastewater by both gravity sewer and force mains. Wastewater is collected by the sanitary sewer system before it is delivered off Base to a wastewater treatment plant owned and operated by WSSC. The IDP assessment of the wastewater treatment system in 2016 found that the system is generally in fair to poor condition, with a majority of the piping needing rehabilitation and/or replacement. A large portion of the systems on JBA are over 50 years old. Terrapin Utility Services, Inc., plans to rehabilitate or replace deteriorating piping and lift stations as part of its privatization contract (JBA, 2016a).

Effluent from WSSC discharges into the Western Branch of the Patuxent River and Piscataway Creek, both impaired water bodies. The current wastewater receiving water body that is within acceptable limits. However, future TMDL constraints on the water bodies WSSC discharges into can have a ripple effect and impact JBA. If stricter restrictions on wastewater discharge are put in place, that could translate into additional limits put on JBA. JBA does not have combined sewer (wastewater and stormwater) outflows. The wastewater collection systems at JBA meet current average and peak demands and could handle future development. However, the system is aging and needs rehabilitation or replacement of some piping. The

biggest area of concern for the future of wastewater at JBA is future TMDL restrictions on the water bodies WSSC discharges into and the ripple effect those changes could have on the installation (JBA, 2016a).

2.2.4.3 Wetlands

Wetlands are protected as a subset of the "waters of the United States" (WUS) under Section 404 of the Clean Water Act (CWA), as well as EO 11990 (*Protection of Wetlands*) which requires federal agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands. The USACE defines wetlands as:

> *"those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328)."*

In addition to the federal regulations protecting wetlands under the CWA, the State of Maryland protects nontidal wetlands under the Maryland Nontidal Wetlands Protection Act. The Maryland Nontidal Wetlands Protection Act seeks to protect nontidal wetlands by regulating and restricting all activities that could impact nontidal wetlands or WUS. The Act also helps to ensure "no net loss" by requiring mitigation or compensation for any wetland losses. The Act also has provisions for the structuring of a smooth and expedient application review process, for dealing with developments in wetlands (USACE, 2006b).

Three aspects of Maryland law differ from Federal regulation: isolated wetlands, the alteration of vegetation and hydrology, and regulation of a 25-foot buffer. Buffer requirements are expanded to 100 feet for "nontidal wetlands of special State concern". These wetland areas are designated by regulation and mapped as having exceptional ecological or educational value of Statewide significance. Currently, there are no "nontidal wetlands of special State concern" located at JBA (USACE, 2006b).

The Nontidal Wetlands Protection Act allows for delegation of all or part of the State program to local governments and provides for the development of watershed management plans. Watershed management plans, developed in accordance with the Nontidal Wetlands Protection Act and the Code of Maryland Regulations (COMAR), can be used as the basis for regulatory decisions. The plans are developed in cooperation with local governments and specifically protect wetlands by incorporating them into the land use decisions of a jurisdiction. The Mattawoman Creek watershed, in which the Brandywine GSU is located, has such a watershed management plan (USACE, 2003).

Regulated activities may not be conducted in a nontidal wetland, or within a buffer or expanded buffer, unless the Maryland has issued a permit or letter of exemption, or the regulated activity is exempt under the Code of Maryland requirements at COMAR 26.23.01.02. Regulated activities include: removal, excavation, or dredging of soil or materials of any kind; changing existing drainage or flood retention characteristics; disturbance of the water level or water table by drainage, impoundment, or other means; filling, dumping, discharging of material, driving piles, or placing obstructions; grading or removal of material that would alter existing topography; destruction or removal of plant life. Activities requiring a Letter of Exemption and recommended BMPs for Letters of Exemption can be found under COMAR 26.23.03.01 (USACE, 2001, 2003).

The Potomac and Patuxent River drainage areas that include JBA contains a significant number of natural wetlands, all of them nontidal. These systems have a profound effect on the hydrologic flow regime of streams and the residence time of water within the basin. Regionally, wetlands are most highly concentrated in heavily forested areas and along stream banks and stream corridors. These wetlands consist mostly of forested, riverine, and palustrine communities commonly found in areas southeast and northeast of JBA. Because of the high groundwater table and low elevations of the region, wetlands were historically

abundant. In general, the palustrine communities are freshwater wetlands and occur most commonly as forested wetlands on the Coastal Plain of Maryland (USACE, 2006b). Prince George's County contains about 6.3 percent of Maryland's total wetland area (Tiner and Burke, 1995).

Wetlands on JBA Main Base are limited because of the Base's upland location. Most wetlands are found adjacent to streams, along pond edges, in drainage ditches and roadway swales, and southeast and southwest of the Main Base (Figure 21). Several wetlands surveys and reports have been conducted for JBA over the past twenty years. These reports provide varying information regarding location and acreage of wetlands (from 87.2 to 150.9 acres) and wetland boundaries that have complicated the jobs of AF planners and environmental staff who deal with the issue of wetlands. A comprehensive, updated wetland delineation for the entirety of the Main Base and the Brandywine GSU are needed to rectify this challenge.

Wetland surveys that have been conducted at the Brandywine GSU have identified between 67.77 and 504.69 acres of wetlands (Figure 22). At the Davidsonville GSU, a comprehensive wetland survey conducted by the USACE in 2007 delineated 72.1 acres of wetlands (Figure 23; USACE, 2007).

The installation maintains a 25-foot buffer boundary around delineated wetlands in accordance with (IAW) the Maryland Nontidal Wetlands Protection Act. Section 2.3.5 contains a detailed description of the different wetland surveys, delineations and jurisdictional determinations that have been conducted at JBA and the types of wetlands that have been identified.

2.2.4.4 Floodplains

Floodplains generally are areas of low, level ground on one or both sides of a stream channel that are subject to either periodic or infrequent inundation by flood waters. Floodplains are typically the result of lateral erosion and deposition that occurs as a river valley is widened. The porous material that composes the floodplain is conducive to retaining water that enters the soil via flooding events and elevated groundwater tables.

Floodplains are regulated by the Federal Emergency Management Agency (FEMA) with standards outlined in 44 Code of Federal Regulations (CFR) Part 60.3. Executive Order (EO) 11988 (*Floodplain Management*) requires agencies to assess the effects that their actions may have on floodplains and to consider alternatives to avoid adverse effects and incompatible development on floodplains. These areas must be reserved to discharge the 100-year flood without cumulatively increasing the water surface elevation more than a designated height. When a floodplain is established, no additional obstruction (e.g., a building) should be placed in the floodplain that will increase the 100-year floodwater surface elevation. Floodplain protection is important to natural resources management at JBA because it directly affects surface water quality and the value of aquatic habitats.

In 2005 JBA prepared a draft floodplain study which indicated that there are seven floodplains located within the boundaries of the Main Base. The floodplains are generally limited to small streams and the area immediately adjacent to these streams (Figure 24). In 2018 JBA participated in an AF pilot study to use environmental GIS data to conduct a more detailed floodplain area analysis for the Main Base (Hanif et al., 2018). The Center for Environmental Management of Military Lands (CEMML) at Colorado State University project is standardizing the geospatial data for 69 environmental features at 96 installations. The floodplain area is one of the environmental features being standardized. The preliminary results of this pilot study are currently being evaluated. A comprehensive and updated floodplain analysis for the entire installation is needed.

Although FEMA has not developed Flood Insurance Rate Maps for the Main Base, FEMA flood maps are available for Brandywine and Davidsonville GSUs. At Brandywine Station, there is a 100-year floodplain associated with the westernmost tributary of Mattawoman Creek (Figure 25). At the Davidsonville GSU, there is a 100-year floodplain associated with the Patuxent River at the western border of the site (Figure 26). These floodplains serve as a buffer between the developed and managed lands and the receiving waters, either as an intact riparian zone or as a collection and detention area for the natural (biological, chemical, and physical) processing of water before it enters the stream.

Figure 17. JBA is within the Potomac and Patuxent River watersheds within the Chesapeake Bay watershed.

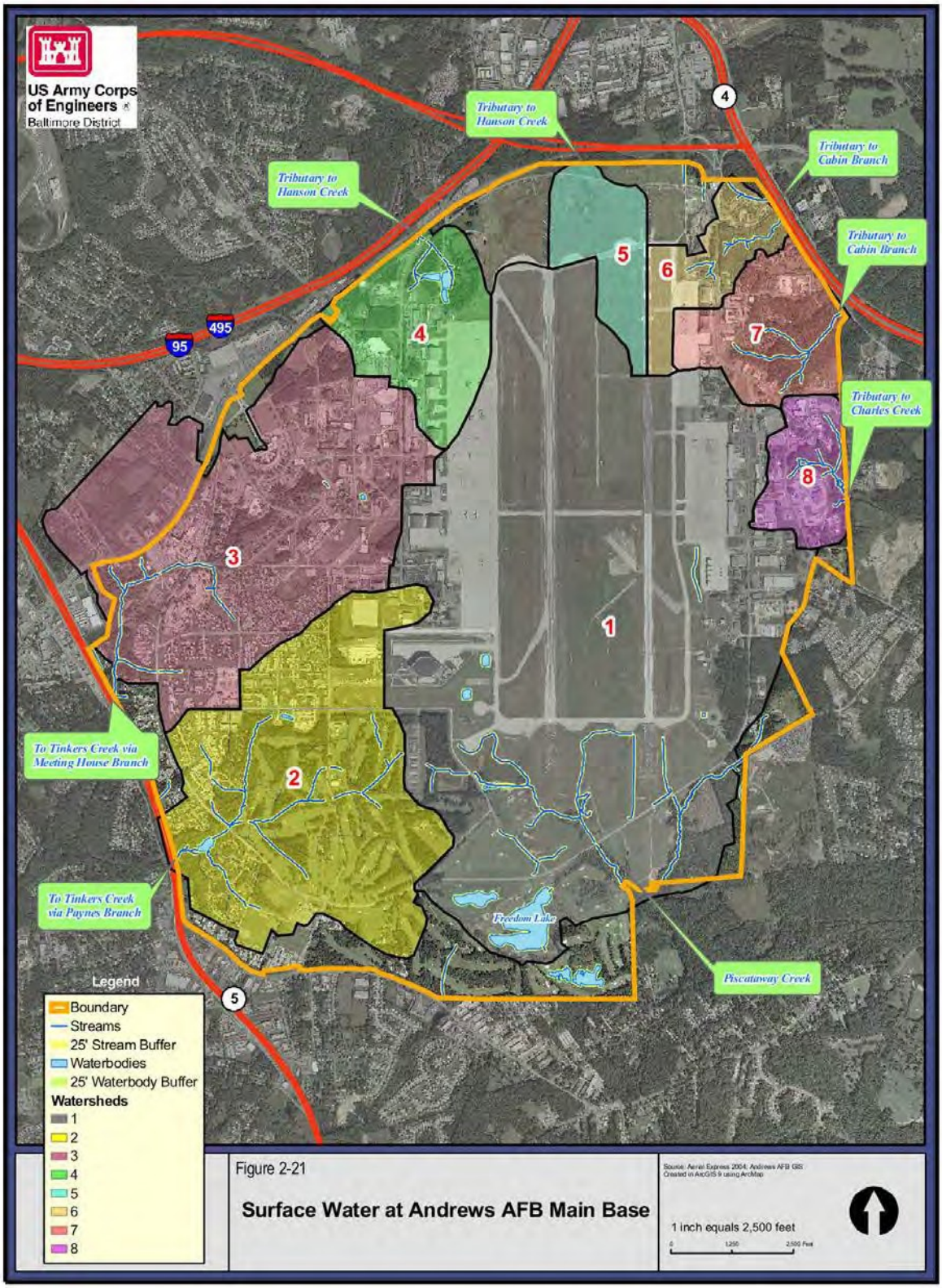

Figure 18. Surface waters at JBA Main Base. Figure from the 2007 INRMP (JBA, 2007).

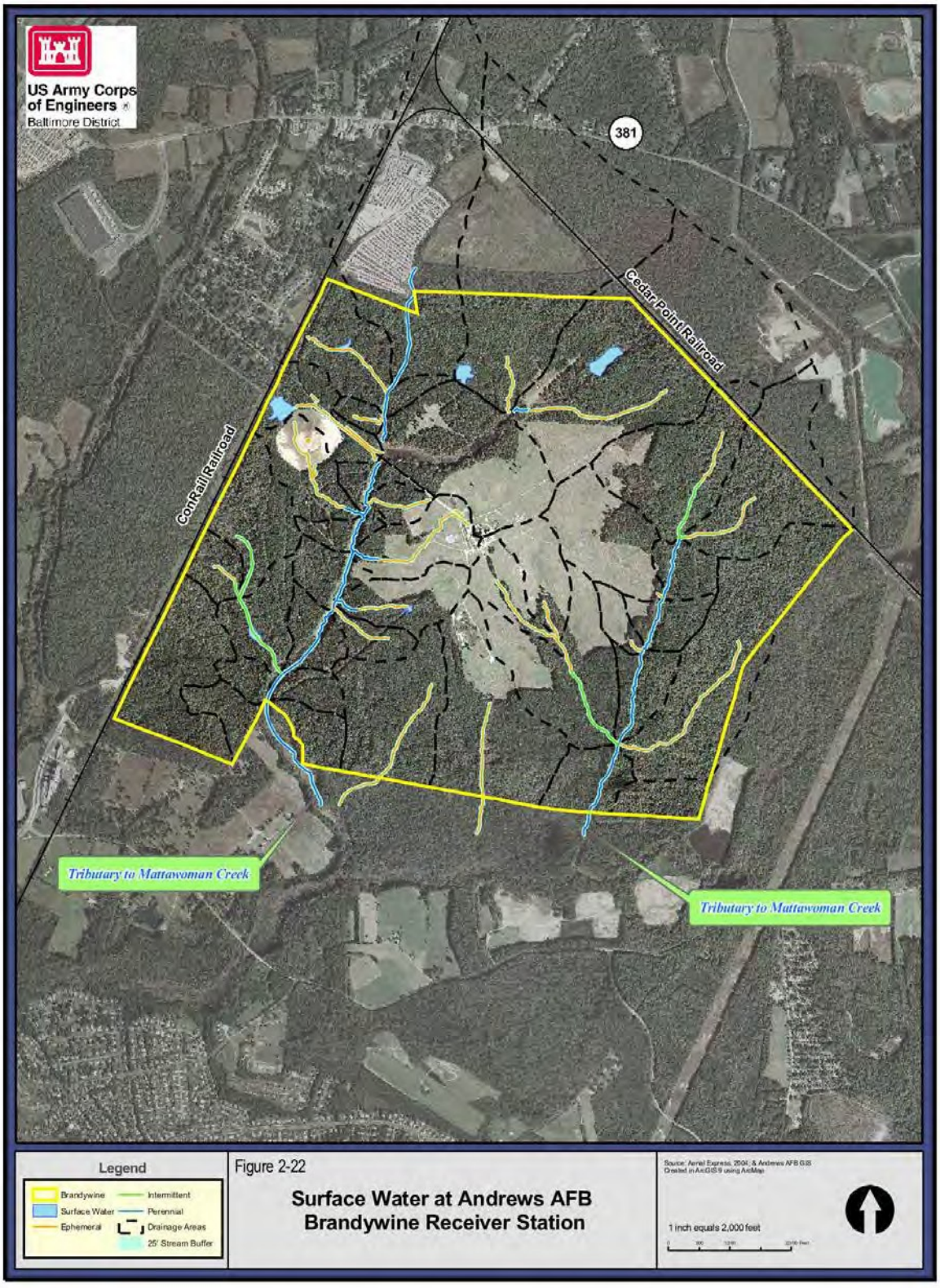

Figure 19. Surface waters at the Brandywine GSU. Figure from the 2007 INRMP (JBA, 2007).

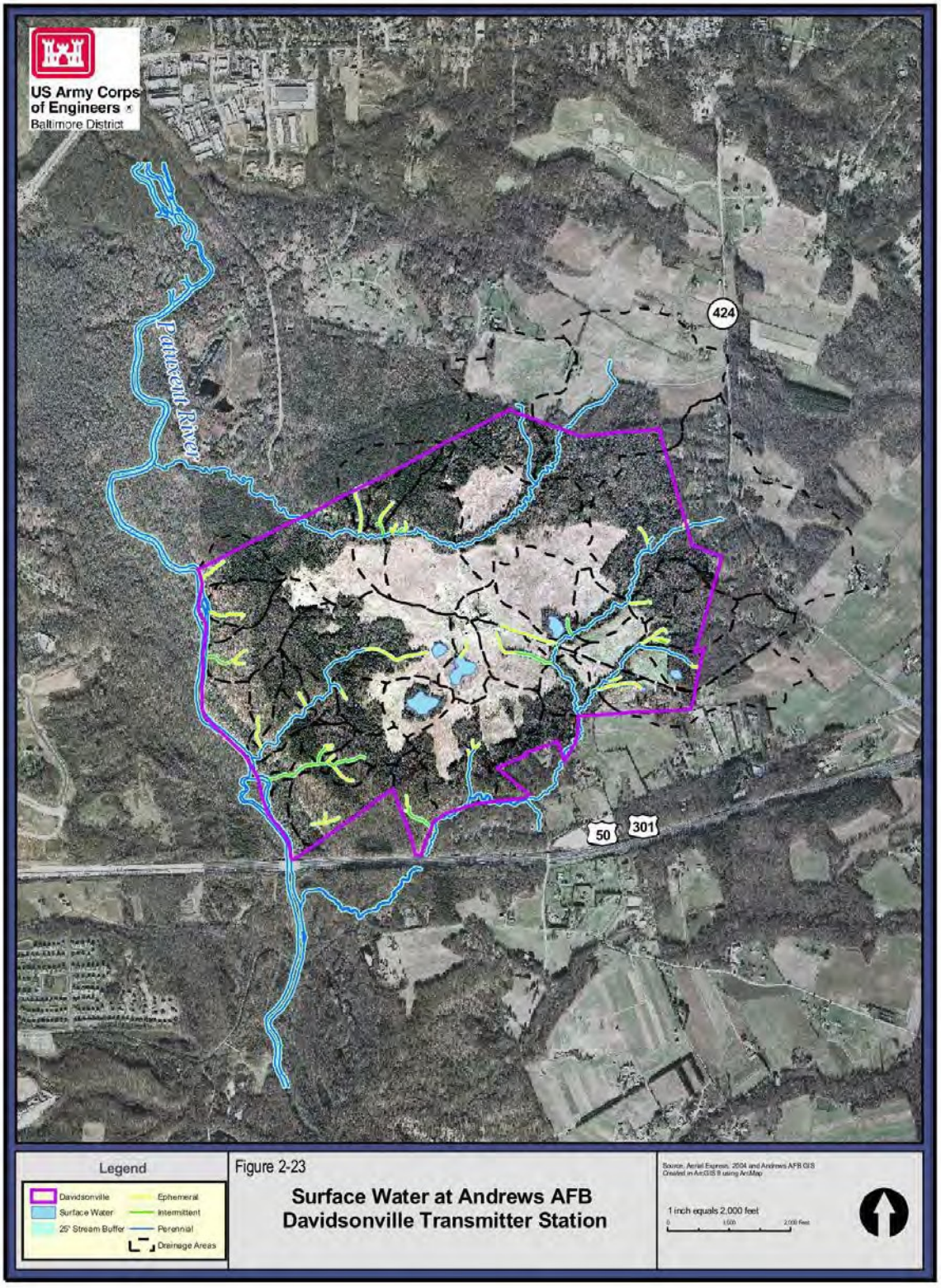

Figure 20. Surface waters at the Davidsonville GSU. Figure from the 2007 INRMP (JBA, 2007).

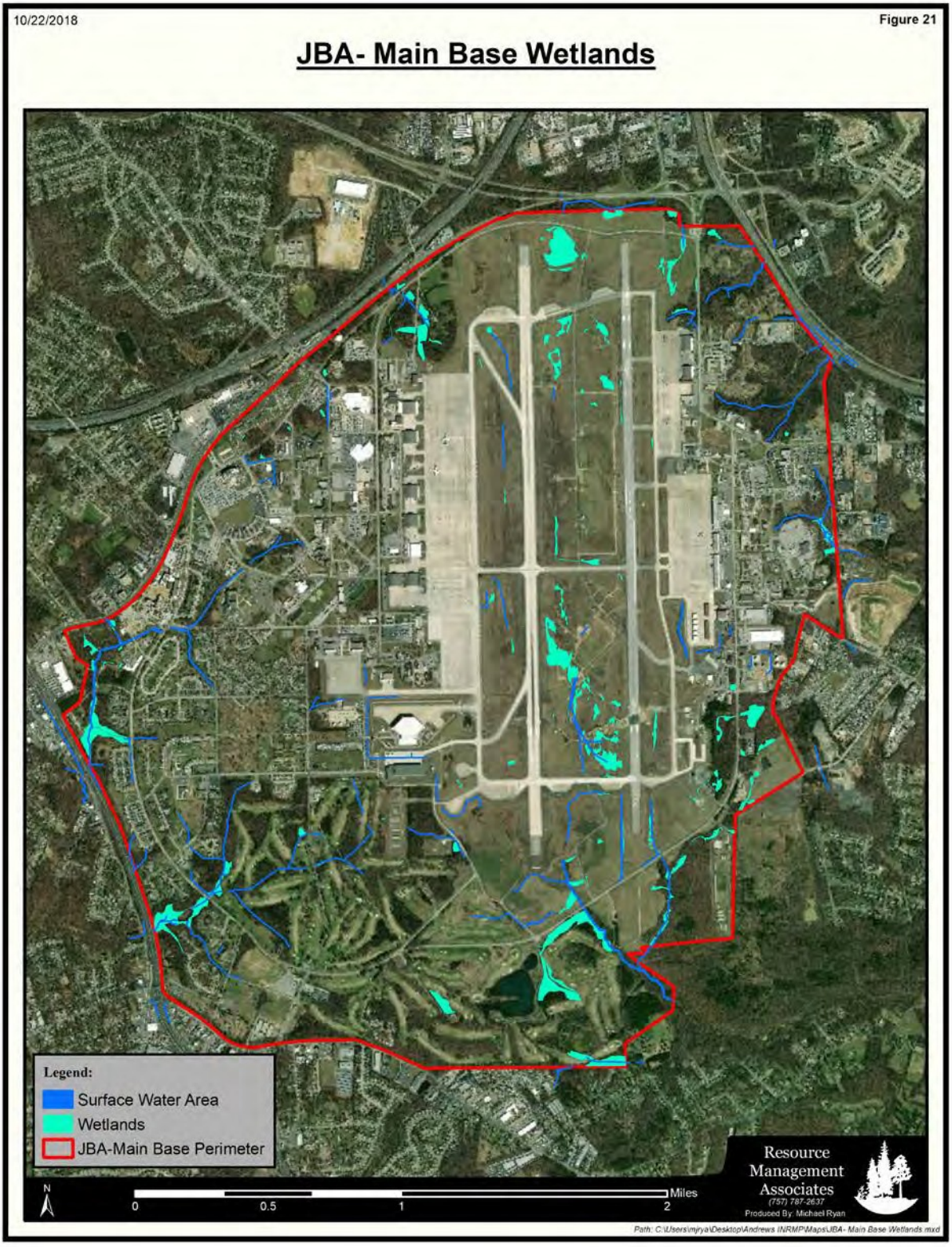

Figure 21. Wetlands at JBA Main Base.

Figure 22. Wetlands at the Brandywine GSU.

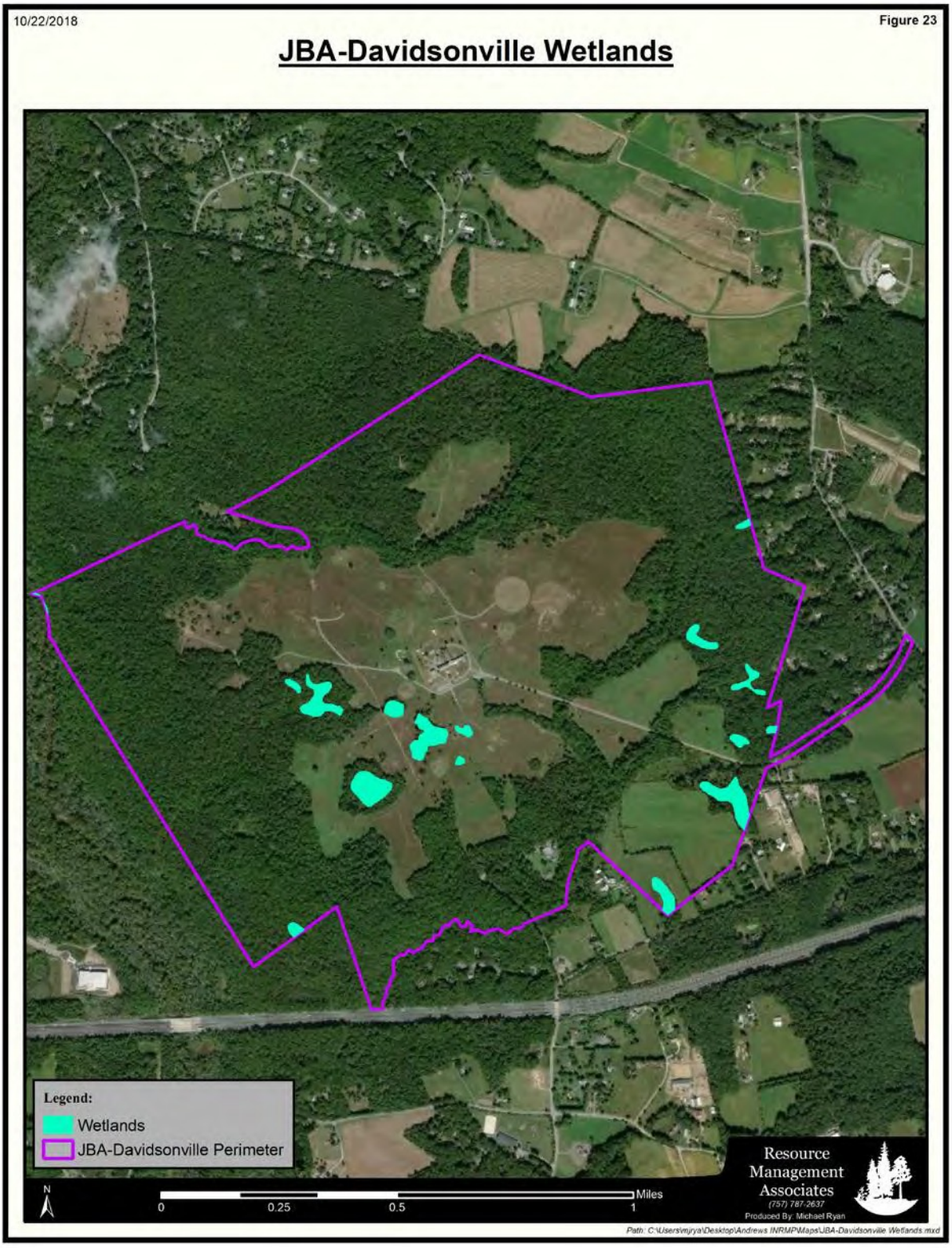

Figure 23. Wetlands the JBA Davidsonville GSU.

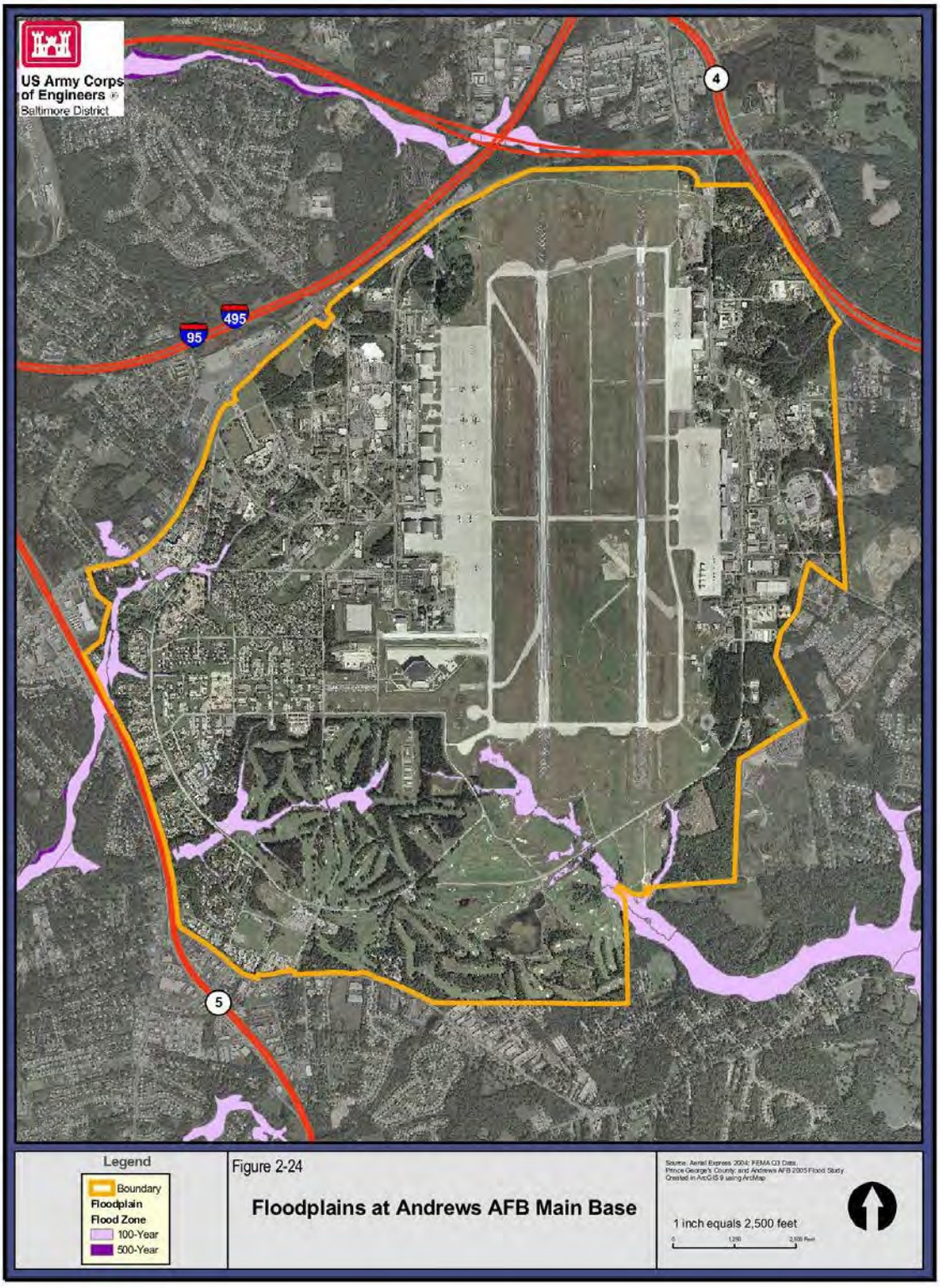

Figure 24. Floodplains at JBA Main Base. Figure from the 2007 INRMP (JBA, 2007).

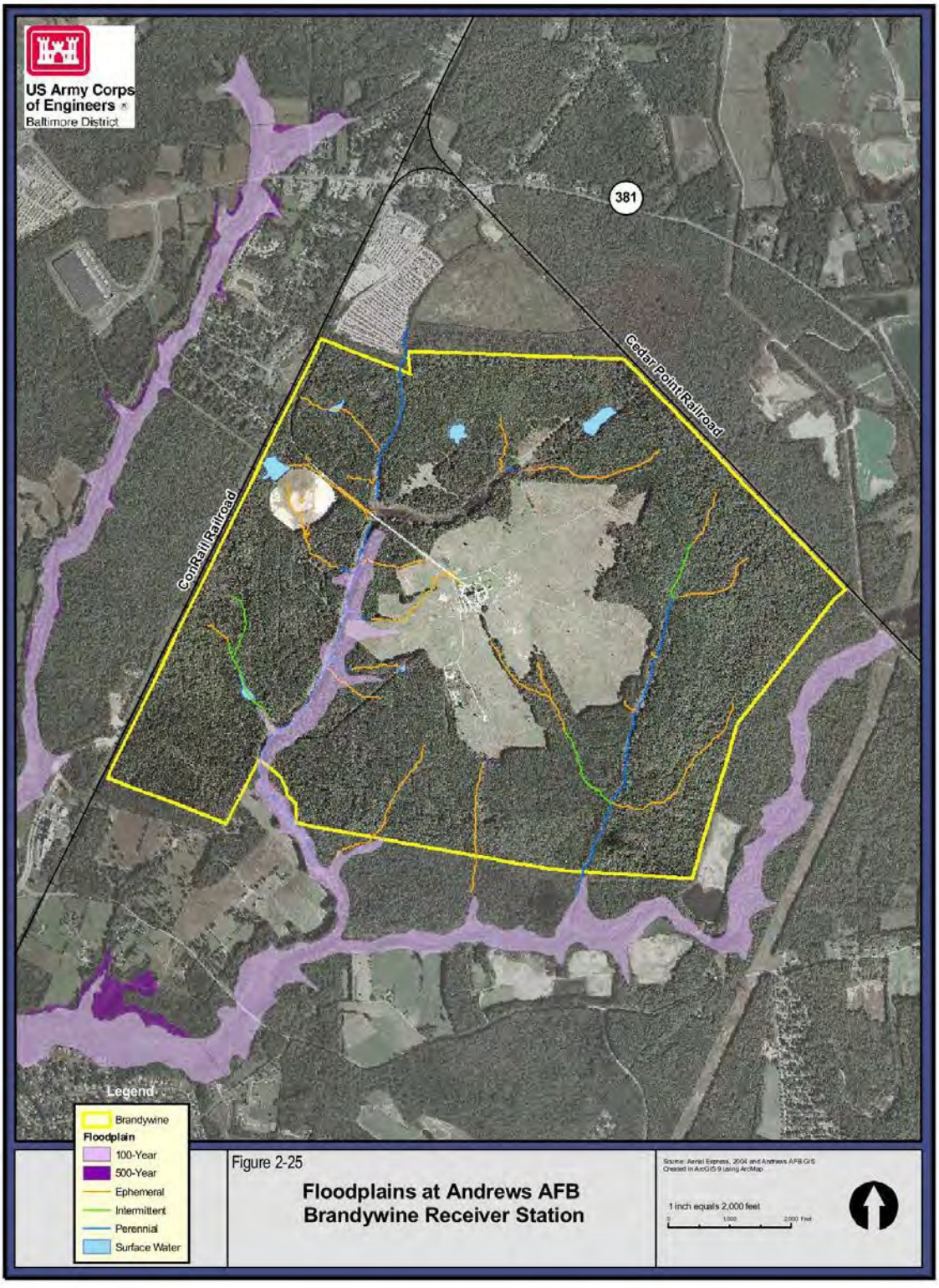

Figure 25. Floodplains at the Brandywine GSU. Figure from the 2007 INRMP (JBA, 2007).

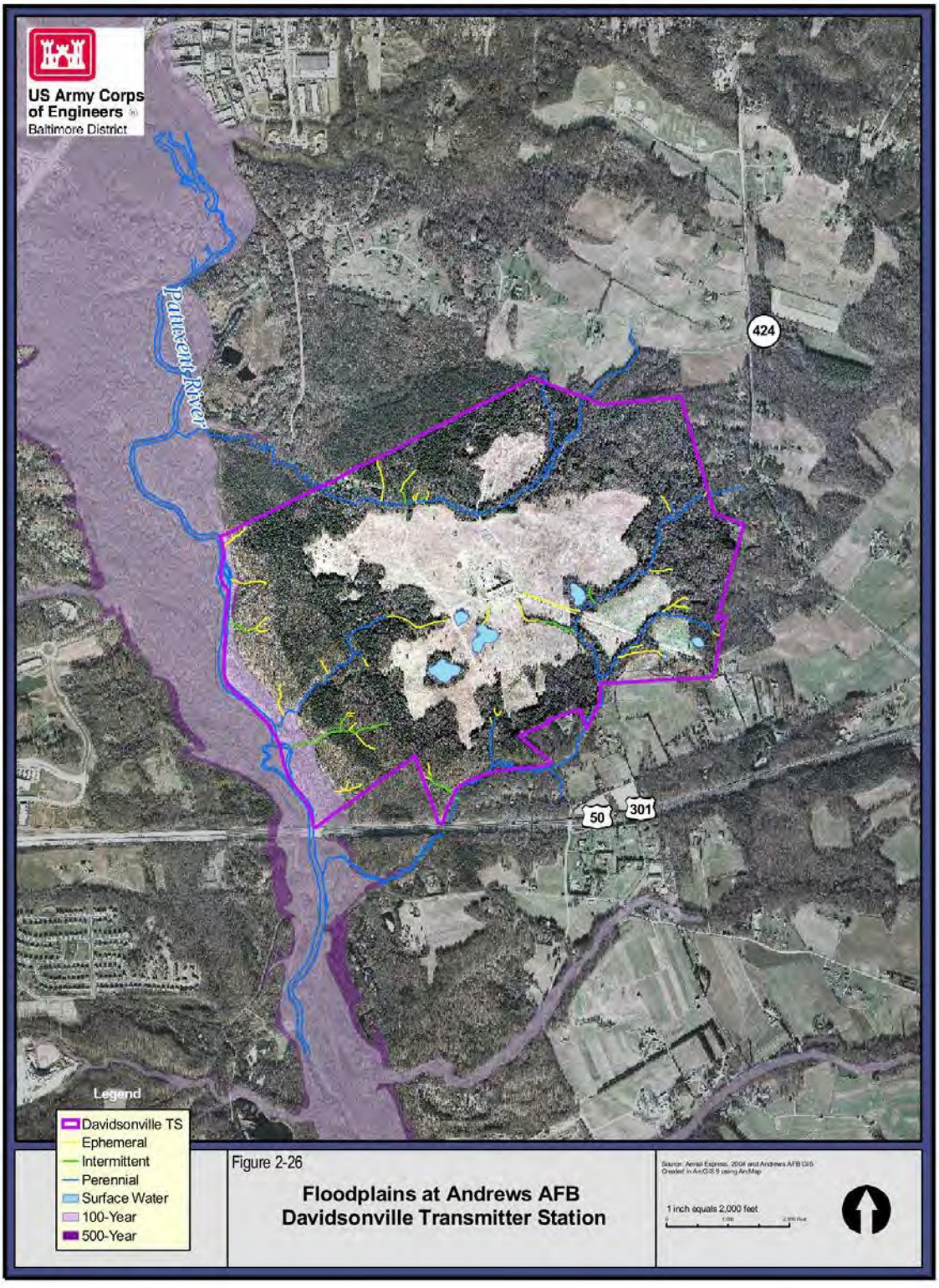

Figure 26. Floodplains at the Davidsonville GSU. Figure from the 2007 INRMP (JBA, 2007).

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

JBA is in the eastern portion of the Outer Coastal Plain Mixed Forest Province – Northern Atlantic Coastal Plain Section (Bailey, 1995). This is equivalent to the Eastern Temperate Forests Region in the USEPA Ecoregions (Level I) and Southeastern US Plains (Level II; CEC, 1997). The Eastern Temperate Forests form a dense forest canopy consisting mostly of tall broadleaf, deciduous trees and needle-leaf conifers (Figure 27). Beech-maple and maple-basswood forest types occur widely, especially in the eastern reaches of this region. Mixed oak-hickory associations are common in the Upper Midwest, changing into oak-hickory-pine mixed forests in the south and the Appalachians. These forests have a diversity of tree, shrub, vine and herb layers. While various species of oaks (*Quercus* spp.), hickories (*Carya* spp.), maples (*Acer* spp.) and pines (*Pinus* spp.) are common, other wide-ranging tree species include ashes (*Sorbus* spp.), elms (*Ulmus* spp.), black cherry (*Prunus serotina*), yellow poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), basswood (*Tilia americana*), hackberry (*Celtis* spp.), common persimmon (*Diospyros virginiana*), eastern red cedar (*Juniperus virginiana*) and flowering dogwood (*Cornus florida*). An important tree species, the American chestnut (*Castanea dentata*), was virtually eliminated from the Eastern Temperate Forests in the first half of the twentieth century by an introduced fungus.

Following the USEPA ecoregion hierarchy, JBA is located within the Chesapeake Rolling Coastal Plain ecoregion (Level IV) within the Southeastern Plains subregion (Level III; Woods et al., 2003). The Southeastern Plains subregion is an interior coastal plain that stretches from Maryland in the north to Mississippi and Louisiana in the south. Historically, the natural vegetation was predominantly longleaf pine (*Pinus palustris*) with smaller areas of oak-hickory-pine forest stands in the north, and in the south native vegetation included some southern mixed forest with beech, sweetgum, southern magnolia, laurel and live oaks, and various pines. Floodplains are forested with bottomland oaks, red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), sweetgum, and American elm (*Ulmus americana*), and areas of bald cypress (*Taxodium distichum*), pond cypress (*Taxodium ascendens*), and water tupelo (*Nyssa aquatica*). The subregion presents a mosaic of cropland, pasture, woodland, and forestland cover. A significant portion of Prince George's County has been deforested for urban and suburban development, particularly in the vicinity of the District of Columbia. Therefore, relatively small remnants of woodland are present in these urbanized areas.

Nearly 80 percent of JBA Main Base is developed or intensely managed. The vegetation occurs largely in association with intensively managed areas (i.e., improved areas): lawns, gardens, golf course fairways, ponds, bare ground, and recreational fields. The airfield environment, including the infield of the airfield (grass areas adjacent to the taxiways ramps, aprons, hot cargo pad and compass rose) and the clear zones, is also intensively managed and is considered as improved area. The remaining patches of original vegetation (i.e., unimproved areas) are a combination of mixed hardwood forest, mixed hardwood/pine forest, oak forest, oak/hickory forest, oak/pine forest, pine forest, red maple swamp, and shallow emergent marsh.

In 2011 an Arbor Plan was prepared for JBA (JBA, 2011). The plan analyzed existing tree cover on Main Base for the period from 1958 to 2009 using aerial imagery, remote sensing and GIS tools. During this 41-year period, the tree cover diminished by several hundred acres. The majority was lost between 1958 and 1974, with a much slower loss rate since that time. The Arbor Plan identified 1,618 acres of tree cover on the Main Base in 1958 and 942 acres in 2009, a loss of 676 acres (JBA, 2011). The 2007 INRMP identified nearly 710 acres present in 2007, however. The Tree Canopy GIS dataset from Prince George's County for 2014 identified 708 acres of tree cover on the Main Base, indicating that the Arbor Plan assessment

overestimated the acreage of forest in 2009 (perhaps due to a difference in methodologies). An updated, comprehensive tree cover survey for the entire Main Base would clarify the total forest area on the Main Base; recent tree surveys have been limited to the airfield imaginary surface zones. Nevertheless, the loss of forest cover at the Main Base appears to be on the order of 910 acres since 1958.

Both the Brandywine and Davidsonville GSUs are much less developed than the Main Base. Approximately 1,345 acres of Brandywine is forestland (as of 2014) and approximately 667 acres at Davidsonville is forest (as of 2006). Vegetation at these sites consists primarily of mixed hardwood forests. This includes pine, oak, hickory and tulip trees. Vegetation in the areas surrounding the antenna fields includes fescue (*Festuca* spp.) and foxtail (*Alopecurus* spp.) at Davidsonville and native grasses and forbs at Brandywine.

Some areas on the Main Base contain patches of nonindigenous, invasive plants. A total of nineteen invasive plant species were reported in surveys conducted in 2006 at Main Base and the Brandywine and Davidsonville Stations: tree-of-heaven (*Ailanthus altissima*), mile-a-minute (*Polygonum perfoliatum*), kudzu (*Pueraria montana*), bamboo (*Phyllostachys* spp.), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), common reed (*Phragmites australis*), English ivy (*Hedera helix*), wintercreeper (*Euonymus fortunei*), privet (*Ligustrum* spp.), common periwinkle (*Vinca minor*), wineberry (*Rubus phoenicolasius*), oriental bittersweet (*Celastrus orbiculatus*), autumn olive (*Elaeagnus umbellata*), Russian olive (*Elaeagnus angustifolia*), bearded beggarticks (*Bidens polylepis*), tall fescue (*Schedonorus phoenix*), purple loosestrife (*Lythrum salicaria*), and Chinese lespedeza (*Lespedeza cuneata*; USACE, 2006c). A new invasive species, the wavy-leaved basket grass, was identified at the Davidsonville GSU in 2012 (USFWS, 2012a). An updated, comprehensive invasive species survey is needed for the Main Base and both GSUs to monitor the effectiveness of recent invasive species control treatments and identify any new invasive species that may require natural resources management.

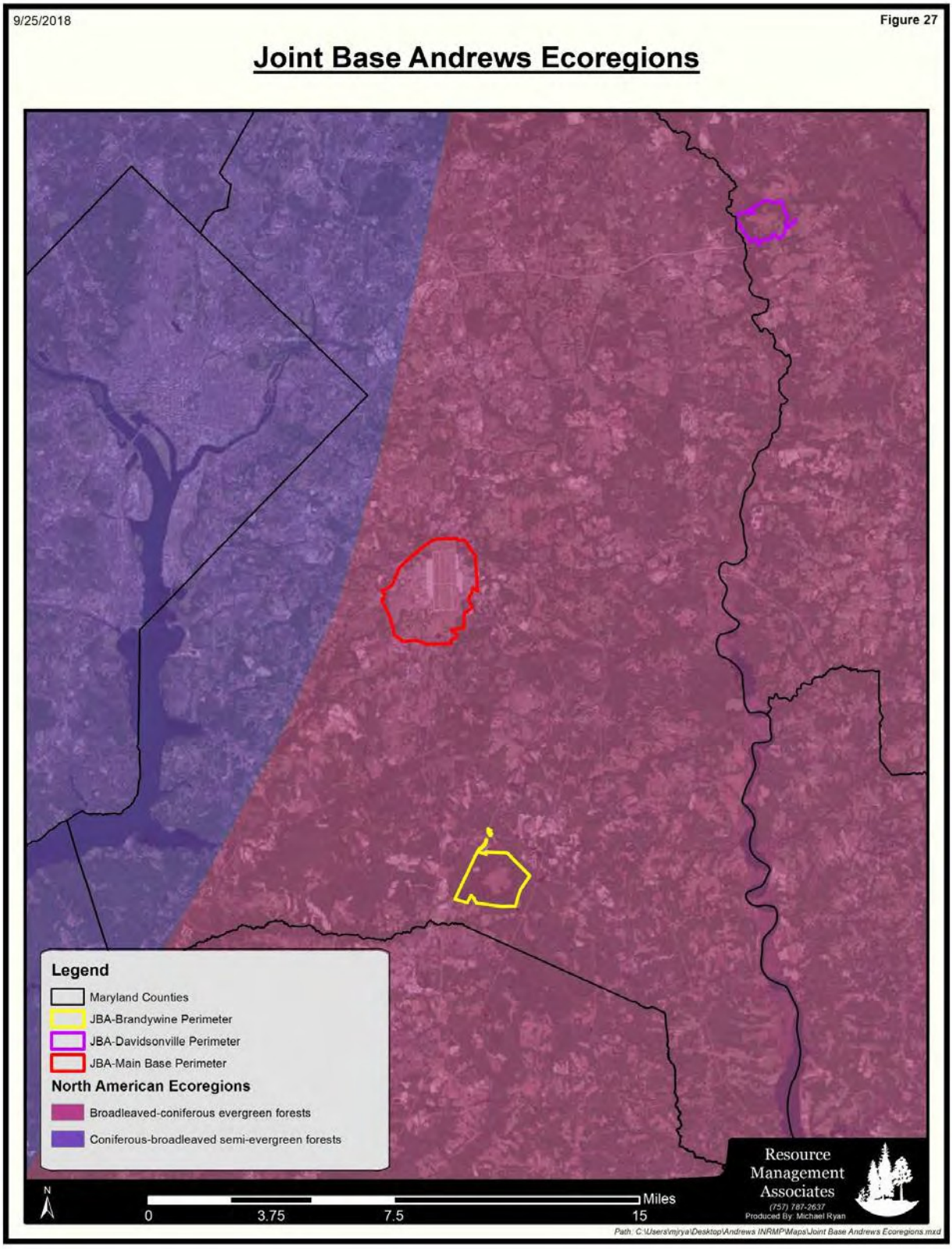

Figure 27. JBA is within the broadleaved-coniferous evergreen forest ecoregion of Bailey (1995).

2.3.2 Vegetation

A significant portion of Prince George's County has been deforested for urban and suburban development, particularly in the vicinity of the District of Columbia. Therefore, relatively small remnants of woodland are present in these urbanized areas. Somewhat more extensive forests occur at distances further from the District, primarily along steeper valley slopes, poorly drained (wetland) areas, floodplains, and public lands. Typical forest species in the remaining woodlands at or near JBA include chestnut oak (*Quercus montana*), white oak (*Quercus alba*), black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), southern red oak (*Quercus falcata*), sugar maple (*Acer saccharum*), red maple, loblolly pine, Virginia pine (*Pinus virginiana*), mockernut hickory (*Carya tomentosa*), black gum (*Nyssa sylvatica*), sweetgum, American beech (*Fagus grandifolia*), yellow poplar, common hackberry (*Celtis occidentalis*), and American holly (*Ilex opaca*). Mountain laurel (*Kalmia latifolia*), highbush blueberry (*Vaccinium corymbosum*), and Christmas fern (*Polystichum acrostichoides*) are common in the understory.

More information regarding vegetation at JBA Main Base and the GSUs is located in the planning level surveys conducted by the USACE in 2006 for flora (USACE, 2006f) and vegetative communities (USACE, 2006g). This information is summarized briefly below.

Main Base

Vegetation communities at JBA Main Base consist of extensively managed landscape areas (improved areas) and other unmanaged patches of natural plant communities. Nearly 80 percent of the Main Base is developed or intensely managed (improved or semi-improved). The intensely managed areas include lawns, gardens, golf course fairways, ponds, bare ground, and recreational fields. Semi-improved areas include runway borders, the infield, and approach clear zones. The remaining unimproved areas support vegetation communities, such as mixed hardwood forests, mixed hardwood-pine forests, oak forests, oak-hickory forests, oak-pine forests, pine forests, pine-oak forests, red maple swamp, and shallow emergent marsh (Figure 28).

Nearly 710 acres of forestland occurs on the Main Base. These forested areas are scattered around the perimeter and southern portion of the Main Base. The forest classifications include modified commercial forestland (MCF), non-commercial forestland (NCF), and restricted commercial forestland (RCF). However, the limited area of forest and urban environment precludes forest management activities for commercial timber production. Approximately 222 acres of MCF occur in scattered stands on the east side of the Main Base, 334 acres of NCF occur in the housing areas and golf courses, and 152 acres of RCF occur in riparian zones.

Some areas on JBA contain patches of nonindigenous, invasive plants, as described in the previous section and summarized in USACE (2006c).

Brandywine Receiver Station and Davidsonville Transmitter Station

The two GSU sites contain similar habitat types, but the constituent species vary somewhat from site to site (Davis, 1994). The open areas at Davidsonville are dominated by planted and invasive grasses, most prominently fescue and foxtail grass (*Setaria* spp.), and a number of invasive herbs. At Brandywine, the open areas around the antennae fields were composed of a relatively large percentage of native grasses and herbs, and relatively few exotic invasive species. Davis (1994) recommended the development of a mowing schedule for all of the open areas to maintain the native plant communities.

In areas where woody vegetation has been reestablished or has remained undisturbed, habitat types include older upland forests in excess of 90 years, young upland forest less than 50 years, wooded wetlands, and floodplain forest. Extensive hydric soils at Brandywine favor plant communities adapted to wet conditions, whereas Davidsonville is better drained and favors drier forest communities.

Brandywine contains ecological communities that include bare ground, mixed hardwood forests, mixed hardwood/pine forests, mowed field, mowed grass, oak forests, oak-hickory forests, old field successional, pine-oak forests, pine forests, red maple swamp, and tulip-oak forest (Figure 29). Davidsonville contains the same ecological community types as Brandywine in addition to beech forest, shallow emergent marsh, and floodplain forest along the Patuxent River (Figure 30).

Approximately 1,220 acres of forestland were identified on Brandywine in the 2006 planning-level survey. The area was mostly pine forest type (393 acres), followed by pine-hardwood (356 acres) and hardwood forest type (286 acres) in the MCF classification. There were approximately 184 acres in the RCF classification for riparian buffers. In 2014, the Prince George's County tree cover dataset identified 1,345 acres of forest at the Brandywine GSU. An updated, comprehensive survey should be conducted to determine whether the forest cover increased by 125 acres between 2006 and 2014 or if the difference between the two analyses is due to methodologies.

Approximately 667 acres of forestland occur on Davidsonville as of 2006. The area is mostly pine-hardwood forest type (309 acres), followed by pine (113 acres) and hardwood forest type (241 acres) in the MCF classification. There are approximately 240 acres in the RCF classification, mostly in the Patuxent River Greenway. An updated, comprehensive survey should be conducted to determine if the forest cover at the Davidsonville GSU has changed since 2006.

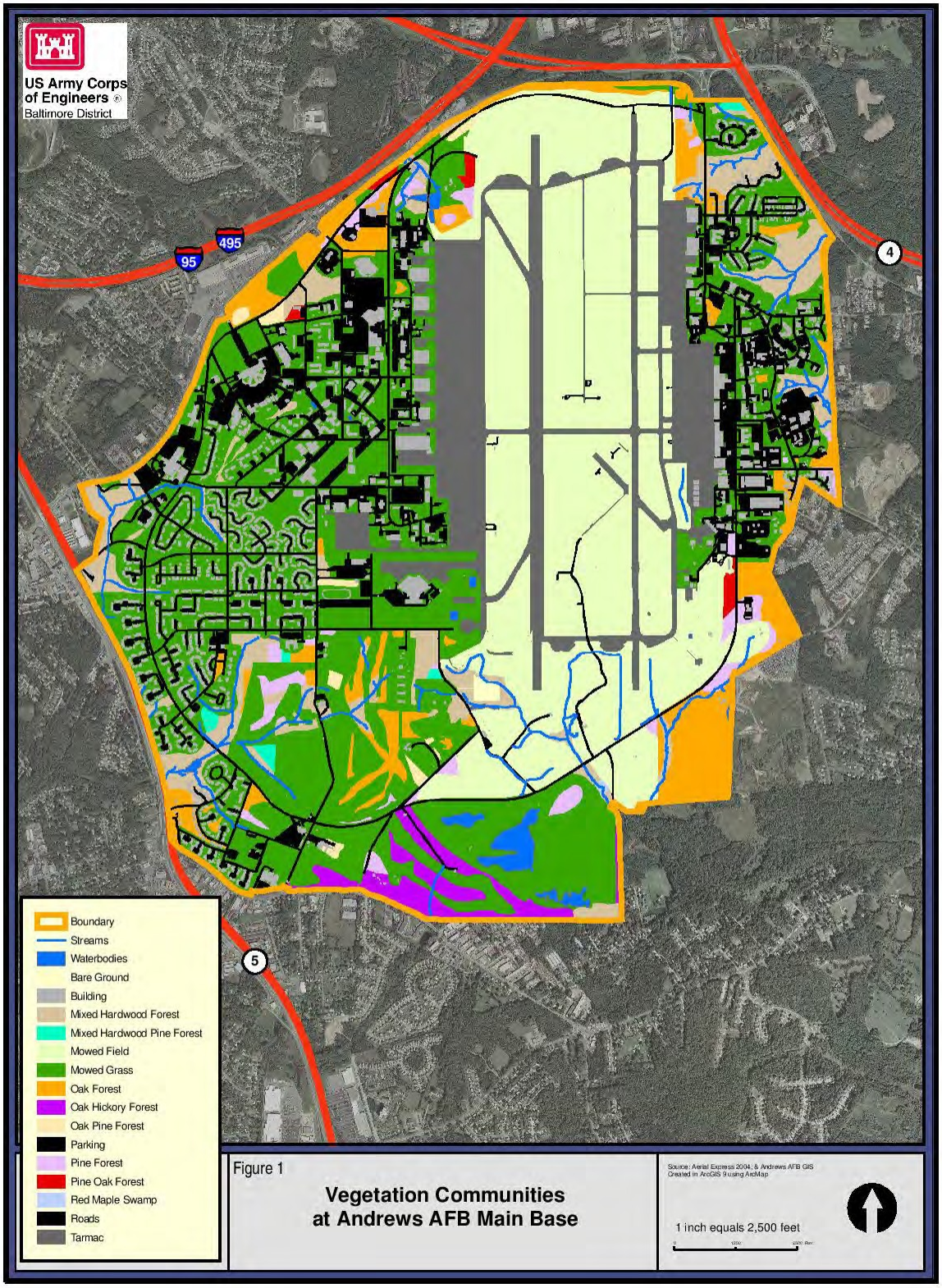

Figure 28. Vegetation communities at JBA Main Base. Figure from the 2007 INRMP (JBA, 2007).

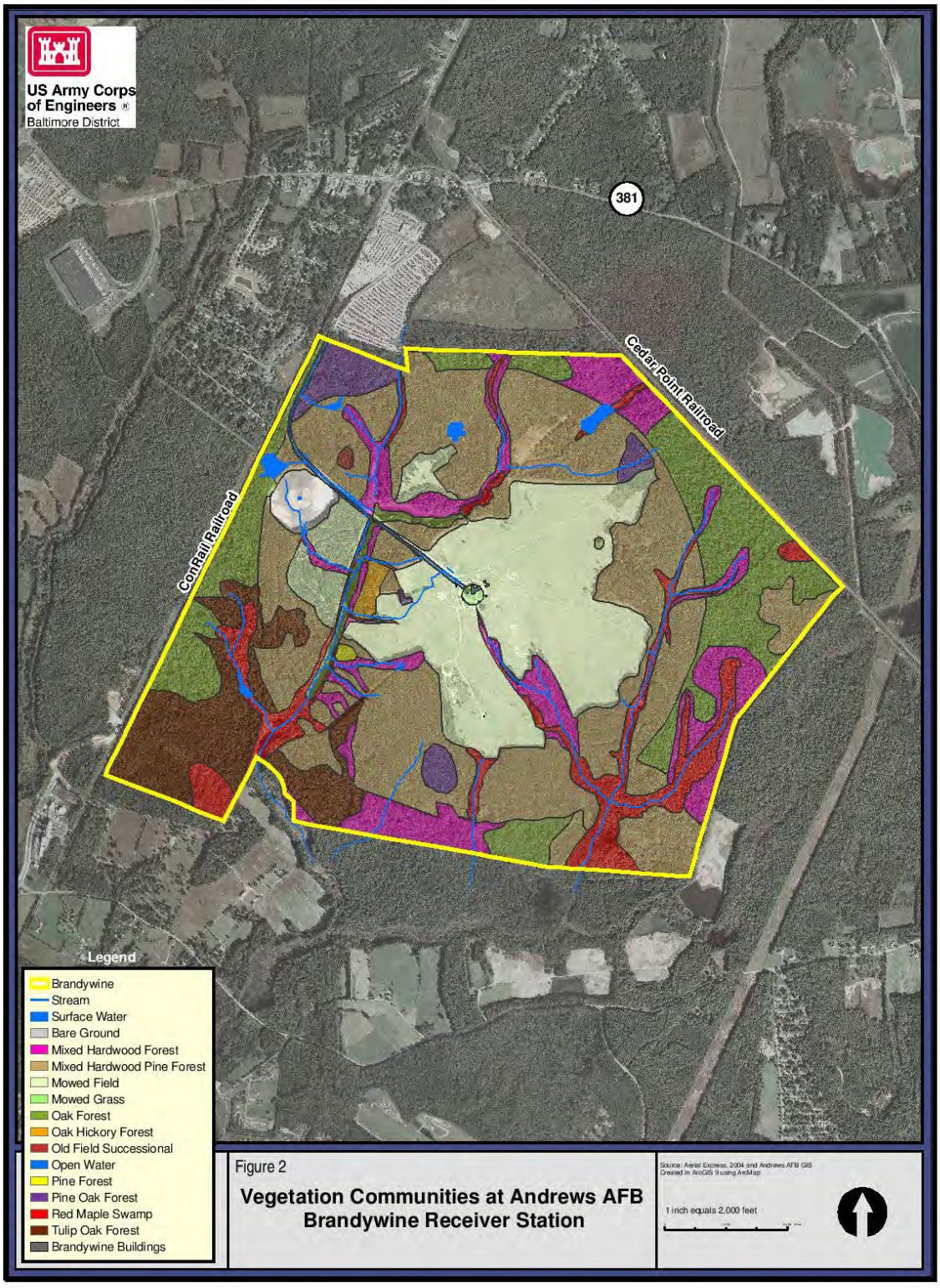

Figure 29. Vegetation communities at the Brandywine GSU. Figure from the 2007 INRMP (JBA, 2007).

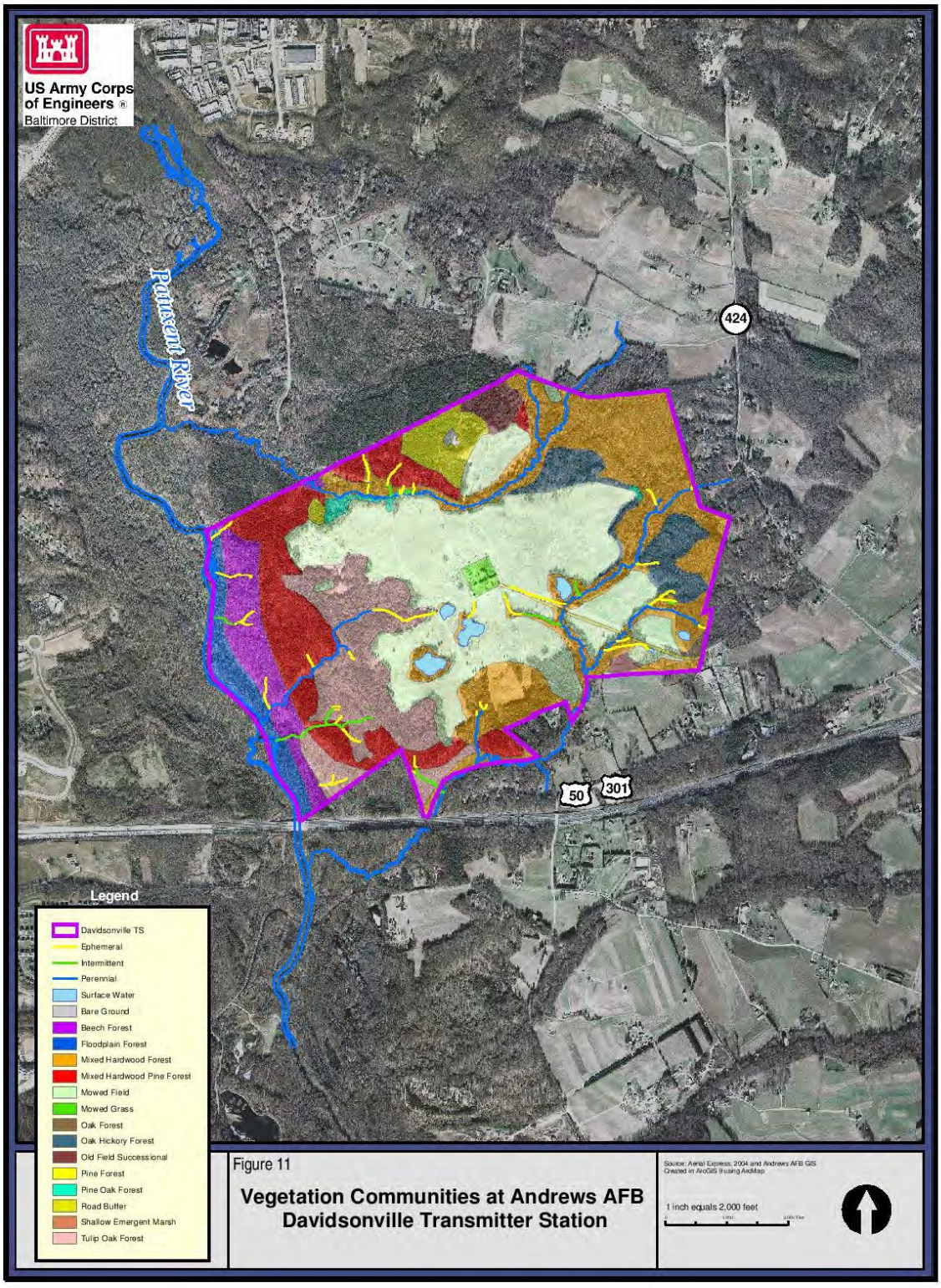

Figure 30. Vegetation communities at the Davidsonville GSU. Figure from the 2007 INRMP (JBA, 2007).

2.3.2.1 Historic Vegetative Cover

Andrews AFB (2005) summarizes the historic vegetative cover for the installation and vicinity prior to European settlement and afterward. Prior to settlement and development, Prince George's County was dominated by dense mixed hardwood forests. While the proportion of densely forested area decreased and the distribution of species changed as the area developed, the historical vegetation of the upland forests was somewhat typical of the vegetation found in the forests of today.

The historic oak forest community consisted of mature stands of oaks, including red oak (*Quercus rubra*), white oak, scarlet oak (*Q. coccinea*), post oak (*Q. stellata*), chestnut oak, and black oak. Many of these species were found in the canopy as well as the subcanopy. Among other species found in the subcanopy were holly, black locust (*Robinia pseudoacacia*), and sassafras (*Sassafras albidum*). The associated understory varied in species composition depending on the successional stage of the community.

Within a mature forest, the shrub layer within this community consisted of an ericaceous heath layer including *Vaccinium* spp. and *Gaylaussacia* spp. The herbaceous layer may have included various grasses, but litter fall and limited sunlight prevented a diverse herbaceous layer from developing.

The historic pine forest community consisted predominantly of pines including pitch pine (*Pinus rigida*), pond pine (*P. serotina*), shortleaf pine (*P. echinata*), loblolly pine (*P.taeda*), and Virginia pine. The associated understory forest varied in composition depending on the successional stage of this forest. Within a mature forest, the understory was undeveloped and contained immature trees of the species found in the canopy. Often the oak forest community and the pine forest community overlapped resulting in a mix of the species found in either of the two communities.

The historic oak hickory forest community was found on dry areas of the landscape. This community historically would have been classified as a chestnut oak forest. However, with the introduction of the chestnut blight in 1939, the chestnut was replaced by hickory. The canopy species included white oak, red oak, and scarlet oak mixed with bitternut hickory (*Carya cordiformis*), mockernut hickory, pignut hickory (*C. glabra*), and sand hickory (*C. pallida*). The understory within this community also varied in species composition depending on the successional stage of the community. Within the mature forest, the understory included holly, black locust, and sassafras. The herbaceous layer in this community was relatively undeveloped.

The historic tulip oak community consisted of mature stands of oak and tulip tree *(Leriodendron tulipifera*). Oaks within this community included white oak and red oak. Other canopy species included poplar (*Populus* spp.). The understory within this community would have included holly, beech (*Fagus grandifolia*), sassafras, and swamp honeysuckle (*Rhodendron viscosum*). The herbaceous layer was limited, but included many saprophytic species including beechdrops (*Epifagus virginiana*), Indian pipe (*Monotropa uniflora*), and cancer root (*Conopholis americana*).

Wetland areas classified as red maple swamp communities were dominated by red maple in both the canopy and subcanopy. The herbaceous layer within this wetland was influenced by the time of the year and hydrology. During the wet growing season when the red maple swamp contained ponded water, aquatic plants could be found including *Azolla* spp., *Lemna* spp. and *Wolfia* spp. During drier periods, the herbaceous layer was dominated by grasses and sedges.

Mixed hardwood swamp communities contained a greater variety of species in the canopy including red maple, black gum, sweetgum, willow oak (*Q. phellos*), silver maple (*A. saccharinum*), ash and elm. The understory consisted of those species found in the canopy as well as *Virburnum* spp. and *Cornus* spp. The herbaceous layer within the mixed hardwood swamp community consisted of grasses and sedges.

The flood plain forest community consisted of flood dependent species such as box maple (*Acer negundo*), ash, elm, and pawpaw (*Asimina triloba*). These species were found in the canopy and subcanopy. The herbaceous layer within this community consisted of grasses.

Settlement in seventeenth century Maryland was primarily confined to the Coastal Plain on lands bordering the lower reaches of the major river valleys and along the shoreline and inlets of Chesapeake Bay. The isolated and dispersed location of early manors and farms along the Chesapeake watershed margin created a water-based transportation network. This settlement pattern initially retarded the growth of commercially based towns because riparian settlement already supplied convenient access to the outside world (JBA, 2014c).

In the 1650s, the first settlers of Prince George's County began occupying the west bank of the Patuxent River adjacent to Calvert County. By 1700, colonists had settled up the river and along its tributaries to within ten miles of the present northern edge of the county. Settlement proceeded more slowly within the county to the west, as Native American groups along the Potomac River discouraged populating the area until the 1700s. However, by the 1730s, population pressure encouraged settlement to the west toward the Potomac River and north into the Piedmont region (JBA, 2014c).

From 1680 to 1815 the region around JBA was a period of rural agricultural intensification, centered on the cultivation of tobacco. Throughout the eighteenth century, and up to the Civil War, Prince George's County concentrated on the staple crop production of tobacco, as did other Atlantic coastal tidewater regions. The pattern of settlement in the early 1700s saw planters moving into Prince George's County from adjacent Anne Arundel, Charles, and Calvert counties. By 1776, Prince George's County had reached its maximum capacity of farmers, which meant land was scarce and the young, beginning farmer had no opportunity in Prince George's County. As a result, these farmers sought farming opportunities outside the county, where land was abundant and settlement density low. Thus it was lack of land, and not soil exhaustion (as once thought), that necessitated migration (JBA, 2014c).

The first signs of soil depletion were in the nineteenth century. Soil exhaustion was a result of **(1)** planters remaining much longer on the land and over-utilizing it, and (2) not enough land for the necessary rotation of the tobacco crop. The depletion came about as the planters approached the western limits of tobacco cultivation. New farmland was no longer locally available and moving far beyond existing farms would make marketing the crop more difficult and more expensive. The first tangible sign of soil depletion was the silting in of streams and waterways rather than a decline in average production levels (JBA, 2014c).

As could be expected, the Civil War dramatically changed the appearance of agriculture in Prince George's County. Tn the post-war period, the cultivation of tobacco gave way to more general, diversified farming that focused on meeting the nutritional needs of the growing urban centers of Washington, D.C., and Baltimore (JBA, 2014c).

Included in the mix of diversified farm output from Prince George's County in the post-Civil War period was a marked increase, almost threefold, in the production of potatoes, along with substantial production gains in dairy products and so-called transportable farm produce. Post-war production of tobacco remained significant in the region bordering the Patuxent River and its tributaries, where the most productive tobacco growing soils in the county existed (JBA, 2014c).

As Prince George's County entered the twentieth century, its population was 30,000 - 30 percent higher than it had been in 1860. The dense development of the City of Washington began to expand beyond its borders, as government workers looked for convenient housing. Along the county's borders with

the District, towns were built, including Takoma Park, Mount Rainier, Brentwood, Capitol Heights, and Seat Pleasant. The county's population doubled in thirty years to 60,000 by 1930 (JBA, 2014c).

Since 1930 the area is characterized as the Modern Period in the ICRMP for JBA (JBA, 2014c). Although lands surrounding Washington, D.C. were primarily devoted to urban and suburban development by the mid-twentieth century, eastern and southern Prince George's County continued to reflect a rural character. Prince George's County ranked first among Maryland counties in acres of farmland under cultivation. In 1959, 1,200 farms occupied approximately 72,000 acres, or 23 percent of the land in the county. Farms on average tended toward a moderate size, with 51 percent between 10 and 99 acres. Tobacco continued to be an important crop on these farms. In 1959, tobacco was grown on 75 percent of all farms in the county. When JBA was first founded in 1941 as Camp Springs Army Air Field, the installation was created out of predominantly farmland and forest, including the country estate and former plantation, Belle Chance.

2.3.2.2 Current Vegetative Cover

There have been no comprehensive vegetative cover surveys for JBA since the 2006 planning level surveys conducted by the USACE (see USACE 2006f, 2006g). The Flora planning level survey (USACE, 2006f) identified 123 plant species (both upland and wetland) on the Main Base and both GSUs. Some updated information is available for tree cover in certain areas of the Main Base, however.

In January 2011 the USACE Baltimore District issued a Tree Survey for JBA (USACE, 2011) based upon a 2010 field survey of 21 study areas, a 2008 Vegetation Management Plan prepared for JBA by Dewberry and Davis LLC (Dewberry and Davis, 2008) and a 2009 tree survey of the Suitland Parkway management area adjacent to the north of the Main Base by Trees America for the NPS (Trees America, 2009). In 2010 the USACE Tree Survey inventoried 2,429 potential tree obstructions into the glide slope ceiling within 384 forested acres on the Main Base and immediately off-Base at both the north and south ends of the runways. Each tree that had or was likely to penetrate the glide slope ceiling was geo-located and tagged; field data was collected and recorded for each tree. The collected forestry data were organized in a format compatible with the JBA geo-base for easy manipulation for forestry management planning, base planning, and United States Standard for Terminal Instrument Procedures (TERPS).

Forest species within the 38.7 total acres of the 2010 tree field survey areas included tulip poplar, red maple, sweetgum, pin oak (*Quercus palustris*), pignut hickory, white oak, chestnut oak, willow oak, Southern red oak, scarlet oak, black oak, black gum, Northern red oak, swamp white oak (*Quercus bicolor*), Virginia pine, post oak, American beech, black cherry, bigtooth aspen (*Populus grandidentata*), black locust (*Robinia pseudoacacia*), slippery elm (*Ulmus rubra*), Bradford pear (*Pyrus calleryana*), white pine (*Pinus strobus*), mockernut hickory, shagbark hickory (*Carya ovata*), green ash, persimmon, American holly, catalpa (*Catalpa* sp.), loblolly pine, red cedar and Tree of Heaven. In late FY2018 JBA initiated a project to update the 2010-2011 Tree Survey for potential obstructions within the approach / departure surface for both ends of the two runways on the Main Base; the project is scheduled for completion in early FY2019.

The best available data for the current vegetation communities at JBA are illustrated in Figures 30-32 and as described in Section 2.3.2 above. An updated, comprehensive vegetation community survey for the entirety of the Main Base and the two GSUs would improve the natural resources management capabilities of the installation.

2.3.2.3 Turf and Landscaped Areas

The Main Base of JBA has large developed areas that contain turf and landscaped areas requiring ongoing maintenance by both Base personnel and service contractors. Grounds maintenance areas are divided into improved, semi-improved and unimproved areas. Improved areas (approximately 341.31 acres) on the Main Base are planted with manicured turf grasses, mulched landscaping beds, and various annuals / perennials, trees and shrubs (Figure 31). The improved grounds are maintained with frequent mowing, edging and trimming, including approximately 7.6 acres of baseball and softball fields and 9.1 acres of athletic fields.

Turf species at JBA include both native and non-native species. Non-native turf species found on the Main Base include crabgrass (*Digitaria sanguinalis*), Japanese stiltgrass (*Microstegium vimineum*) and reed canary grass (*Phalaris arundinacea*). In accordance with the BASH Plan, turf areas in the airfield are in the process of being converted to a monoculture to reduce habitat attractiveness to rodents, which are prey for several species of birds that pose aircraft strike hazards. Grass height is managed in the airfield to be between 7 and 14 inches in height. Grass left too tall will go to seed, which attracts birds and also provides hiding and nesting areas for rodents. However, grass cut too short will attract birds to feed and socialize. The preferred grass species in the BASH Plan is fescue (JBA, 2014a).

Landscaped areas on the JBA Main Base are located around most of the approximately 584 buildings, at the entry gates, and along many transportation corridors such as the National Executive Route. As of FY2018 there were approximately 3.04 acres of mulched landscaping beds on the Main Base. An estimated 5,000 trees and shrubs are trimmed or pruned annually on the Main Base, and diseased or dead trees or shrubs are removed and replaced as needed. Trees planted along the transportation corridors and gateways of the Main Base are predominantly mixed hardwoods, most commonly maples and oaks. Tree species include red maple, sugar maple, red oak, white oak, willow oak, Bradford pear, cherries (*Prunus* sp.), white pine, Crape myrtle (*Lagerstroemia indica*), linden (*Tilla cordata*), sycamore (*Platanus occidentalis*), Eastern red cedar, Eastern redbud (*Cercis canadensis*), plum (*Prunus* sp.), American holly, chestnut (*Castanea* sp.), honey locust (*Gleditsia triancanthos*) and bald cypress (JBA, 2011). There are no landscaped areas at the Brandywine or Davidsonville GSUs. The JBA Arbor Plan contains a plant database for recommended species of trees as well as landscaping guidelines and planting plans for various transportation corridors and gateways on the Main Base. The Arbor Plan recommends removal of Bradford pears, designated as invasive by the State of Maryland, and other trees in poor condition and replacing them with non-invasive species from the planting list (JBA, 2011).

Semi-improved grounds are located on approximately 156.82 acres of the installation, with about two acres at the Brandywine GSU, approximately six acres at the Davidsonville GSU and the remainder on the Main Base. At the Brandywine GSU, about 331 acres of mowed field surround two acres of mowed grass in the developed area; grass species are predominantly native species with relatively few exotic invasive species. Grasses at the Davidsonville GSU are dominated by fescue and foxtail grass, with about 295 acres of mowed field surrounding about six acres of mowed grass in the developed area (Andrews AFB, 2005).

Unimproved grounds are located along 7.86 acres of the Main Base perimeter fence line, nine acres elsewhere on the Main Base, nearly 260 acres at the Brandywine GSU and nearly 270 acres at the Davidsonville GSU. These areas are typically mowed only once or twice a year, with a maximum grass height allowed of 24 inches. Vegetation species diversity is higher in the unimproved areas due to their infrequent maintenance. Unimproved areas located on forest edges are undergoing natural regeneration, with a dense herbaceous layer dominated by goldenrod (*Solidago* spp.), nettle (*Urtica* spp.), poison ivy

(*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*) and various grasses (JBA, 2017c).

Turf and landscaped areas within the privatized housing area, Liberty Park, on the Main Base are maintained by the housing contractor and/or individual residents.

The three golf courses at the Courses of Andrews include approximately 75 acres managed as manicured tees, fairways and greens. The remaining golf course lands consist of rough and forest. In the spring of 2018, three 1-acre patches of rough were converted to butterfly waystations by planting of milkweed (*Asclepias* spp.) and various wildflowers as part of the Monarchs in the Rough program sponsored by Audubon International and the Environmental Defense Fund. A fourth Monarchs in the Rough habitat, also roughly one acre in size, is planned to be constructed in FY2019 as part of the realignment of several holes to accommodate the adjacent PAR Complex.

Figure 31. Turf and landscaping maintenance areas at JBA Main Base.

2.3.3 Fish and Wildlife

The rare species survey conducted by Davis (1994) included limited sampling of animal species at JBA. Although a total inventory was not performed, the study identified 84 species of birds in a variety of ecological communities including open water, red maple swamp, mixed hardwood forest, old field successional, mowed field, and mowed grass. Birds associated with open water communities included Canada geese (*Branta canadensis*), green heron (*Butorides virescens*), great blue heron (*Ardea herodias*), and mallard (*Anas platyrhynchos*). Birds associated with mixed hardwood forests included eastern wood pewee (*Contopus virens*), rufous-sided towhee (*Pipilo erythrophthalmus*), and red-eyed vireo (*Vireo olivaceus*). Birds associated with red maple swamp included prothonatary warbler (*Protonotaria citrea*) and black and white warbler (*Mniotilta varia*). Birds associated with mowed grass included Carolina chickadee (*Poecile carolinensis*), Carolina wren (*Thryothorus ludivicianus*), common crow (*Corvus brachyrhynchos*), and house finch (*Carpodacus mexicanus*).

In 2014 JBA installed 30 nesting boxes for various bird and bat species on the Main Base. The nest boxes were installed in some of the stormwater restoration areas, mostly in the area near the hospital between Boston Road and West Perimeter Road. JBA had previously installed over 120 bluebird boxes at the Main Base, but due to the success of the program in the 1990s the program was discontinued and the last of the boxes were removed in 2018.

Birds associated with old field successional and mowed field included eastern meadowlark (*Sturnella magna*), eastern bluebird (*Sialia sialis*), and grasshopper sparrow (*Ammodramus savannarum*). Identified raptors included great horned owl (*Bubo virginianus*), eastern screech owl (*Otus asio*), American kestrel (*Falco sparverius*), red-shouldered hawk (*Buteo lineatus*), and red-tailed hawk (*Buteo jamaicensis*).

To date, there have been no complete surveys of mammals, reptiles, or amphibians at JBA Main Base or the GSUs. Five species of small mammals were trapped at the Brandywine Receiver Station as part of the 1994 rare species survey. Three species of shrews, southeastern shrew (*Sorex longerostris*), least shrew (*Cryptotis parva*), and short-tailed shrew (*Blarina brevicauda*), one mouse species, white-footed mouse (*Peromyscus leucopus*), and one vole species, meadow vole (*Microtus pennsylvanicus*) were captured at the site. Other mammals known to occur at JBA are white-tailed deer (*Odocoileus virginianus*), beavers (C*astor canadensis*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis marsupialis*), eastern gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*) and various species of bats and small mammals. A number of bat houses have been installed at Brandywine for mosquito control, however no bat occupancy has been confirmed to date.

Based on casual observation and interviews with Base personnel, the deer population at the Main Base appears to be on the increase. Although there is a perimeter fence around the Main Base, the fence has a number of breaches that allow deer migration on and off the Main Base. JBA has a deer depredation permit from MD DNR to harvest deer and keep the deer population under control. Control of the deer population on the airfield at JBA is critical to the flight safety mission.

Fishing is essentially limited to the Main Base Lake (Freedom Lake). Fish species in the lake include largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), carp (*Cyprinus carpio*), bluegill (*Lepomus macrochirus*), and catfish (*Ictalurus punctatus*). A full list of the known species to occur at JBA appears in the USACE Fauna Planning-Level Survey (USACE, 2006d).

Beavers are considered a nuisance animal in Maryland. Non-lethal measures of beaver control are used whenever possible (see Section 7.1). There have been past occasions at JBA where beavers have caused

some drainage problems. Beaver control measures at the installation are coordinated with MD DNR. There is evidence of current beaver activity at the Main Base and Brandywine.

Birds roost in many hangars and pose health concerns from the droppings accumulation, as well as causing cleaning problems for the aircraft surfaces. Past methods employed to reduce the roosting were installation of an artificial owl and an ultrasound unit that emitted a "predatory" sound. The owl was useful for a while, until some birds became acclimated. The ultrasound unit was stolen. Additionally, vertebrate control professionals do not recommend the use of ultrasound since it has been scientifically shown to be ineffective. A more recent bird scaring device, the Peaceful Pyramid, which uses a rotating pyramid that reflects light to repel birds, has been installed at several locations on the Main Base with only marginal success. Current practice involves good housekeeping measures such as ensuring that doors and windows are kept closed to prevent access to the hangars by birds. This practice of eliminating access has had the most success and has been the least costly to implement.

There are occasional requests made to 11 CES Entomology by Base residents for removal of rats, snakes (black rat and garter), bats, Virginia opossum, and raccoons. Captured animals are relocated to an appropriate habitat at one of the remote sites.

In 2017, the USFWS coordinated with the AFCEC to develop a *USAF Pollinator Conservation Strategy* with a reference guide (USFWS, 2017). Three pollinator species have recently been listed or petitioned to list that occur in Maryland are the regal fritillary (*Speyeria idalia*), yellow-banded bumble bee (*Bombus terricola*) and monarch butterfly (*Danaus plexippus plexippus*). Petitioned species are considered "at-risk" species by the USFWS. The monarch butterfly is documented to occur on both the Main Base and both GSUs (USACE, 2006d). The Courses at Andrews participates in the Monarchs in the Rough Program, sponsored by Audubon International and the Environmental Defense Fund, and has installed approximately three acres of butterfly waystation habitat at the golf courses, with plans to install a fourth one-acre waystation. It is not currently known if the yellow-banded bumble bee or regal fritillary occur at JBA.

Other insects documented to occur at JBA include silvery checkerspot (*Chlosyne nycteis*), eastern tailed-blue (*Cupido comyntas*), bluet damselfly (*Enallagma* sp.), mayflies (*Ephemeroptera* spp.), zebra swallowtail (*Eurytides marcellus*), common whitetail dragonfly (*Libellula lydia*), red-spotted purple (*Limenitis arthemis*), black swallowtail (*Papilio polyxenes*), cabbage white (*Pieris rapae*), eastern tiger swallowtail (*Pterourus glaucus*), great spangled fritillary (*Speyeria cybele*) and various dragonflies and damselflies (USACE, 2006d).

Although there is a data gap for a comprehensive faunal survey at the installation, there is other MD DNR for fish and wildlife species at or near JBA. The streams around the Main Base support resident warmwater fish communities but are too far upstream to support anadromous fish spawning runs (MD DNR, 2018b). The main stem of the Patuxent River adjacent to the Davidsonville GSU supports warmwater game fish and other resident species as well as migration and spawning of anadromous species (MD DNR, 2018b). Streams at and near the Brandywine GSU also support warmwater resident fish communities but anadromous fish spawning occurs farther downstream. The downstream portion of Mattawoman Creek supports a very high quality tidal estuary that is important for tidal bass sportfish and migratory anadromous fish (MD DNR, 2018b).

MD DNR has identified potential habitat for Forest Interior Dwelling Species (FIDS) for the state, and the GIS dataset for FIDS indicates potential habitat occurs on two small areas on the east side of the Main Base and at nearly all of the forested areas at Brandywine and Davidsonville (see Maryland Environmental Resource and Land Information Network [MERLIN] at http://gisapps.dnr.state.md.us/MERLIN/index.html).

According to MERLIN data, MD DNR has identified Targeted Ecological Areas that include portions of JBA. Targeted Ecological Areas are watersheds and lands with high ecological value that have been identified as conservation priorities by MD DNR for natural resource protection, which considers these areas the most ecologically valuable areas in the state. Areas identified for inclusion in Targeted Ecological Areas include those that provide contiguous blocks of forest or wetland habitat, green infrastructure hubs and corridors that facilitate plant and animal migration, areas that provide important ecological services, habitat for rare, threatened and endangered species, habitat for state species of Greatest Conservation Need (SGCN), concentrations of wildlife, hotspots of aquatic life, and other ecologically valuable sites along coastal and tidal areas (MERLIN, 2018).

On the Main Base, a 325-acre area overlying the East and West Golf Courses and nearby JADOC site has been identified as a Targeted Ecological Area. Four smaller Targeted Ecological Areas identified on the Main Base include a 10.9-acre area spanning North Perimeter Road between Robert M. Bond Drive and F Street; a 9.12-acre area directly east of the first, bordered by Brookley Avenue, F Street, Colorado Avenue and North Perimeter Road; a 3.34-acre area near Belle Chance; a 43.37-acre area spanning Patrick Avenue south of North Gate; and an 83.18-acre forested area surrounding the new JADOC Satellite Site and extending off-Base. Nearly the entire Brandywine GSU is within a Targeted Ecological Area composed of nearly 132,000 contiguous acres of habitat that spans Prince George's, Charles and Anne Arundel Counties. Most of the Davidsonville GSU is included within a separate Targeted Ecological Area of nearly 2,000 contiguous acres that span both sides of the Patuxent River in Prince George's and Ann Arundel Counties. MERLIN (2018) does not provide any information about the specific ecological resources within each of these Targeted Ecological Areas at JBA.

MD DNR has also identified most of the Davidsonville GSU as a Sensitive Species Project Review Area (MERLIN, 2018). Sensitive Species Project Review Areas contain buffered habitat for rare, threatened and endangered species and rare natural community types. The Sensitive Species Project Review Area for the Davidsonville GSU is in Group 2, or state-listed species. On the Main Base, two small Sensitive Species Project Review Areas are located at the southeast corner of the East Runway and southeast of Base Lake; both are in Group 3 for species or natural communities of concern to MD DNR but with no official status.

The Maryland Amphibian and Reptile Atlas (MARA) contains 2014 survey data on amphibians and reptiles for the whole state (Natural History Society and MD DNR, 2018). Two areas on the JBA Main Base were identified in MARA on the Upper Marlboro Quadrangle and Quadrangle Block, but no information was available regarding what reptile or amphibian species have been identified there by MARA.

The natural resources management capabilities of JBA would be improved by an updated, comprehensive fish and wildlife survey of the Main Base and both GSUs. An updated survey would provide JBA with information needed for planning future projects, potential coordination or collaboration with MD DNR regarding areas identified as Targeted Ecological Areas and Sensitive Species Project Review Areas, future updates of the INRMP, and natural resources management.

2.3.4 Threatened and Endangered Species and Species of Concern

The only federally listed species known to occur, as of 2016, at JBA is the endangered sandplain gerardia (*Agalinus acuta*), which has been documented to occur approximately ¼ mile east of Base Lake, near Piscataway Creek. Sandplain gerardia is an annual pale green herb that typically occurs on dry, sandy, poor-nutrient soils of sparsely vegetated sandplain environments and serpentine barrens. No Federally listed species are known to occur on the lands of the Davidsonville GSU and Brandywine GSU (MD DNR, 27 March 2012).

A Threatened and Endangered (T&E) Species Survey was conducted in 2004 for JBA, updating 1996 and 1997 natural resources surveys which in turn were updates to an original 1993 survey (Ecology and Environment, Inc., 2005). The 2004 survey, which was published in 2005, indicated the bald eagle had been observed during the 1996 and 1997 surveys. Once a federally listed species, effective August 8, 2007, under the authority of the Endangered Species Act of 1973, as amended, the USFWS removed the bald eagle in the lower 48 states from the Federal List of Endangered and Threatened Wildlife. However, the bald eagle is still protected by the Bald and Golden Eagle Protection Act, Lacey Act and the Migratory Bird Treaty Act (USFWS, 2012b).

Seven rare plant species, as classified by the state, were also identified in the 2004 T&E Survey. Based on MD DNR records, there are four additional rare species that were observed in the past (MD DNR, 2012a). Hyssop-leaved Hedge-nettle (*Stachys hyssopifolia*) was documented in 1993 as occurring on the southwest end of the Davidsonville Transmitter Station, in mowed old field habitat near young woodland edge. The state-listed, threatened Racemed Milkwort (*Polygala polygama*) was documented as occurring in 1993 at the railroad right-of-way just east of the Brandywine Receiver Station Boundary. The state-listed, endangered Midwestern Gerardia (*Agalinis skinneriana*) was documented as occurring in 1995 at Brandywine near one of the *Linum intercursum* sites, on clay lens habitat. An occurrence of *Carex buxbaumii* is located on the railroad right-of-way in the easternmost part of the Brandywine site (MD DNR, 2012a).

Current fisheries information indicates that yellow perch have been documented near the Davidsonville site, as well as white perch and clupid species. No anadromous species have been documented near the Main Base and the Brandywine site (MD DNR, 2012b). Anadromous fish are born in freshwater streams, migrate to the ocean, then return to freshwater rivers to spawn.

In 2006 the USACE, under direction by the 316th CES of Andrews AFB, was tasked with reviewing the previously identified Federal and State rare, threatened, and endangered (RTE) plants and animals at the JBA Main Base and the geographically separated units at Brandywine and Davidsonville (USACE, 2006h). The USACE devised a monitoring schedule based on the blooming and/or fruiting period for the identified plants. The study team used Global Positioning System (GPS) technology in the field to find RTE plant communities mapped for the November 2001 INRMP. Once the team entered the previously mapped polygon, they spread out to locate individuals of the known RTE plant species.

Once a plant was tentatively identified as being the RTE species, the species was verified using *Herbaceous Plants of Maryland* (Brown and Brown, 1984). The study team then mapped the areal extent of the Rare, Threatened, and Endangered (RTE) plant, using the GPS unit to create spatially referenced points to create a new polygon. In cases where non-contiguous populations of RTE plants were identified, a distinct polygon was mapped for each population (USACE, 2006h).

Animals were monitored for at each site visit. Visual inspections were made of appropriate habitat.

The USACE identified RTE plants at both Brandywine and Davidsonville GSUs in 2006 but did not identify any additional RTE species at the Main Base (USACE, 2006h). Table 8 lists the RTE species identified in the 2006 survey. Figures 32, 33 and 34 show the approximate locations for previously-identified RTE species at the Main Base, Brandywine GSU and Davidsonville GSU, respectively.

Table 8. Rare, threatened or endangered species identified in a 2006 survey of JBA by the USACE (USACE, 2006h).

Scientific Name	Common Name	Species Status	Location
Carex bullata	Button sedge	State threatened	Brandywine: small, isolated depressional wetlands within the mowed wet meadow mosaic
Carex buxbaumii	Buxbaum's sedge	State endangered	Brandywine: southern end of meadow area; small, partially shaded depressions along the edge of the woods and within woodland openings
Helianthemum bicknellii	Hoary frostweed	State endangered	Davidsonville: open, sandy soil within vehicle trails, where the vegetation was disturbed and bare sand was exposed.
Matelea carolinensis	Anglepod	State endangered	Davidsonville: large mowed meadow in the northeast quadrant, with full sunlight, and taller plants (particularly grasses) to climb
Linum intercursum	Sandplain flax	State endangered	Brandywine: open (non-wooded) sandy substrate in the northern half of the installation
Stenanthium gramineum	Featherbells	State threatened	Davidsonville: windthrow near the hay field near the entrance to the site.
Spiranthes tuberose	Little lady's tresses	State watch-list	Brandywine: open (non-wooded) sandy substrate in the northern half of the installation
Galactia volubilis	Downy milk-pea	State rare	Davidsonville: western edge of the mowed areas, with sandy soil, open vegetative cover, and protective treeline

The 2006 USACE survey for RTE attempted to relocate all of the previously identified RTE species at JBA. On the Main Base, the 2006 RTE survey was unable to relocate the Highly State Rare spiral pondweed (*Potamogeton spirillus*), Possibly Rare Curtis's three-awn grass (*Aristida dichotoma var. curtissii*), Federal Endangered sandplain gerardia, or State Endangered ten-lobed agalinis (*Agalinis obtusifolia*). At Brandywine, the 2006 RTE study team was unable to relocate swollen bladderwort but did identify suitable habitat for the species in a swamp near the previously identified location. The State threatened racemed millwort (*Polygala polygama*), State Endangered pale false mannagrass (*Torreyochloa pallida*), State Endangered clasping-leaved St. John's wort (*Hypericum gymnathum*), State Watch List downy bushclover (*Lespedeza stuevei*), and State Endangered skinner's foxglove (*Agalinis skinneriana*) were not relocated. The survey identified one new species of interest, pink ladyslipper orchid (*Cyprideium acaule*), at the site where swollen bladderwort was previously located. Although the pink ladyslipper orchid is not currently

state- or federally-listed, it is a species of particular interest to botanists and natural heritage professionals and has the potential for over-collection by orchid enthusiasts (USACE, 2006h).

At Davidsonville the 2006 RTE survey was not able to relocate the State Extirpated sidebells wintergreen (*Orthilia secunda*), State Possibly Rare hyssop-leaved hedgenettle (*Stachys hyssopifolia*), State Watch List ground cedar (*Lycopodium tristachyum*), or State Watch List downy bushclover.

The 2006 RTE study team also took the opportunity to further evaluate the formerly identified bald eagle habitat at the western edge of Base Lake. This location was found to be unsuited to bald eagle nesting or long-term habitation. This location lacks the tall trees and standing dead trees required for nesting, and lacks flowing and/or deep, clear water for feeding. This location is directly under an aircraft approach, and between the well-used golf course and recreational Base Lake. This location would be too loud and busy for successful nesting, and it is doubtful that a breeding pair would choose to stay there rather than a more suitable and remote location. It is likely that bald eagles occasionally fly over, and may even land to rest, at JBA Main Base, but it is very unlikely that they are breeding or otherwise using the site as an important part of their habitat (USACE, 2006h).

Because JBA, like any institution, has only limited funding for T&E species conservation, it is necessary to prioritize the list of T&E species so that money that is available can be allotted wisely. Each T&E species has been assigned a Heritage Status Rank: a global, national, and state rank for conservation priority, which indicates how rare the plant or animal is. Species with a rank of G5, for example, are considered globally secure, meaning that the Association for Biodiversity Information considers the species to be not particularly likely to go extinct, based on data created by worldwide research. These species can still be considered rare and in need of conservation at the national and/or state level, so those rankings are considered as well when prioritizing species for conservation (USACE, 2006h).

USACE (2006h) sorted the list of identified RTE species at JBA to show the species of highest conservation priority. Species management plans (such as Management Action Plans) must be developed for each species with Heritage Status Rank G1 through G3, N1 through N3, and S1 through S3, IAW DoD Instruction 4715.3. As a result, two species – sandplain gerardia and Skinner's foxglove – should have species management plans; JBA currently has a species management plan for sandplain gerardia and maintains a 2.30-acre management area on the golf courses for the species. Nineteen plant species have a high state need only (S1 – S3), but eight of them were not relocated in the 2006 RTE survey. Four of the RTE species – *Sorex longirostris, Alopecurus carolinianus, Orthilia secunda,* and *Aristida dichotoma var. curtissii* – do not require management plans (USACE, 2006h).

No comprehensive RTE surveys have been conducted at JBA since 2006, resulting in an information gap on the current status and location, if any, of RTE and petitioned species at the installation. Informal surveys have located sandplain gerardia within the management area as recently as 2016, and mowing was conducted to control competing vegetation in FY2018. A new, comprehensive RTE survey is needed to identify the current presence or absence of RTE species and the need for any species management plans.

In April 2015 the Northern long-eared bat (*Myotis septentrionalis*) was listed as federally-threatened; the bat is also listed as state-threatened. The habitat for the Northern long-eared bat is a variety of forested and wooded habitats, tree-lined corridors and some adjacent non-forest habitats including emergent wetlands, pastures, old fields and agricultural field edges. Northern long-eared bats are also known to roost in manmade structures such as bat houses, under bridges and in buildings or barns. The bats hibernate in the winter, generally in underground caves or cave-like structures (CIRE, 2018; USFWS, 2014).

A bat survey was conducted during May-August of 2017 at JBA, as part of a larger project to study 47 AF installations to determine the presence of bat species using acoustic monitoring. Five bat detectors recorded bat activity at JBA and reported that the mean activity rate at the Base (380.0 bat passes/detector-night) ranked in the top third of the 47 installations sampled in the project (CIRE, 2018). Nine species of bats

were acoustically detected, five of which were manually confirmed. Confirmed species include the big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and tri-colored bat (*Perimyotis subflavus*). Four species were not confirmed manually and included the Northern long-eared bat, evening bat (*Nycticeius humeralis*), eastern small-footed bat (*Myotis leibii*) and little brown bat (*Myotis lucifugus*) (CIRE, 2018).

All nine species of bats acoustically-identified at JBA are listed as a SGCN in Maryland. The eastern small-footed bat is listed as State Endangered and Highly State Rare (S1). The little brown bat and tri-colored bats are Highly State Rare (S1). Only ten species of bat occur in Maryland, and the acoustic survey indicates JBA may host nine of the ten species at the installation. The acoustic bat survey should be followed up with manual surveys, which should clarify or confirm the preliminary results of these RTE bat species at JBA. Because JBA periodically conducts tree trimming and removal in the flight zones, manual surveys to confirm the potential presence of the Northern long-eared bat and eastern small-footed bat should be undertaken as soon as possible.

Three pollinator species that occur in Maryland have been petitioned for listing under the ESA and the USFWS is currently reviewing these species for potential listing. These species are the regal fritillary, monarch butterfly and yellow-banded bumble bee. Monarchs have been observed on the Main Base and both GSUs (USACE, 2006d; JBA, 2017c). The *USAF Pollinator Conservation Reference Guide* provides detailed descriptions of each of these species and recommendations for their conservation, including a list of BMPs (USFWS, 2017). JBA recently has installed bee hives in two locations, at the golf courses near Base Lake and near the Pest Management building. No data are available to determine whether the regal fritillary or yellow-banded bumble bee occur at JBA. These species should be included in a comprehensive RTE survey update for the installation.

The USFWS was petitioned in 2015 to list the wood turtle (*Clemmys insculpta*) and spotted turtle (*Clemmys guttata*) under the ESA. Petitioned species are considered "at-risk" species by the USFWS. Maryland is within the previously known range of both turtle species. The wood turtle is associated with several types of forest and wet habitats, including oak-hickory forest, basic mesic forest and mesic mixed hardwood forest habitats that could be present at JBA (MD DNR, 2015). Similarly, the spotted turtle is associated with oak-hickory forest, basic mesic forest, mesic mixed hardwood forest, coastal plain oak-pine forest, coastal plain floodplain habitats, coastal plain seepage swamps and coastal plain streams and rivers, among others, that could be present at JBA (MD DNR, 2015). No data are available to determine whether the wood or spotted turtles occur at JBA. These species should be included in a comprehensive RTE survey update for the installation.

Maryland updated the State Wildlife Action Plan (SWAP) in 2015 (MD DNR, 2015). The Maryland SWAP identifies species in greatest need of conservation in the state, key habitats to support them, threats to the conservation of SGCN and key habitats, and a series of conservation actions for each. The Maryland SWAP also provides a detailed description of the state's land and water resources as well as how climate change is expected to affect natural resources in the state. Chapter 4 of the Maryland SWAP (MD DNR, 2015) describes each of the key wildlife habitats in the state, their county distribution, signature state rare plants associated with the habitat, and SGCN associated with the habitat.

Key wildlife habitats known to occur in Prince George's and Anne Arundel Counties with the potential to occur at JBA include:

- Basic Mesic Forest
- Mesic Mixed Hardwood Forest
- Coastal Plain Oak-Pine Forest

- Coastal Plain Pitch Pine Forest
- Coastal Plain Floodplain
- Coastal Plain Flatwoods and Depression Swamp
- Coastal Plain Seepage Swamp
- Coastal Plain – Piedmont Acidic Seepage Bog / Fen
- Coastal Plain Stream
- Coastal Plain River

No current data are available to determine if any of the forests at JBA are key wildlife habitats IAW the Maryland SWAP, but it is likely that the streams, floodplains and wetlands at the installation are key wildlife habitats since JBA is in the Coastal Plain. The Patuxent River, a Coastal Plain River, borders the Davidsonville GSU. The key wildlife habitats listed above should be included in a comprehensive RTE survey update for the installation. If identified on the Base, the conservation actions listed in the Maryland SWAP (MD DNR, 2015) should be reviewed for possible inclusion in the next INRMP update or revision.

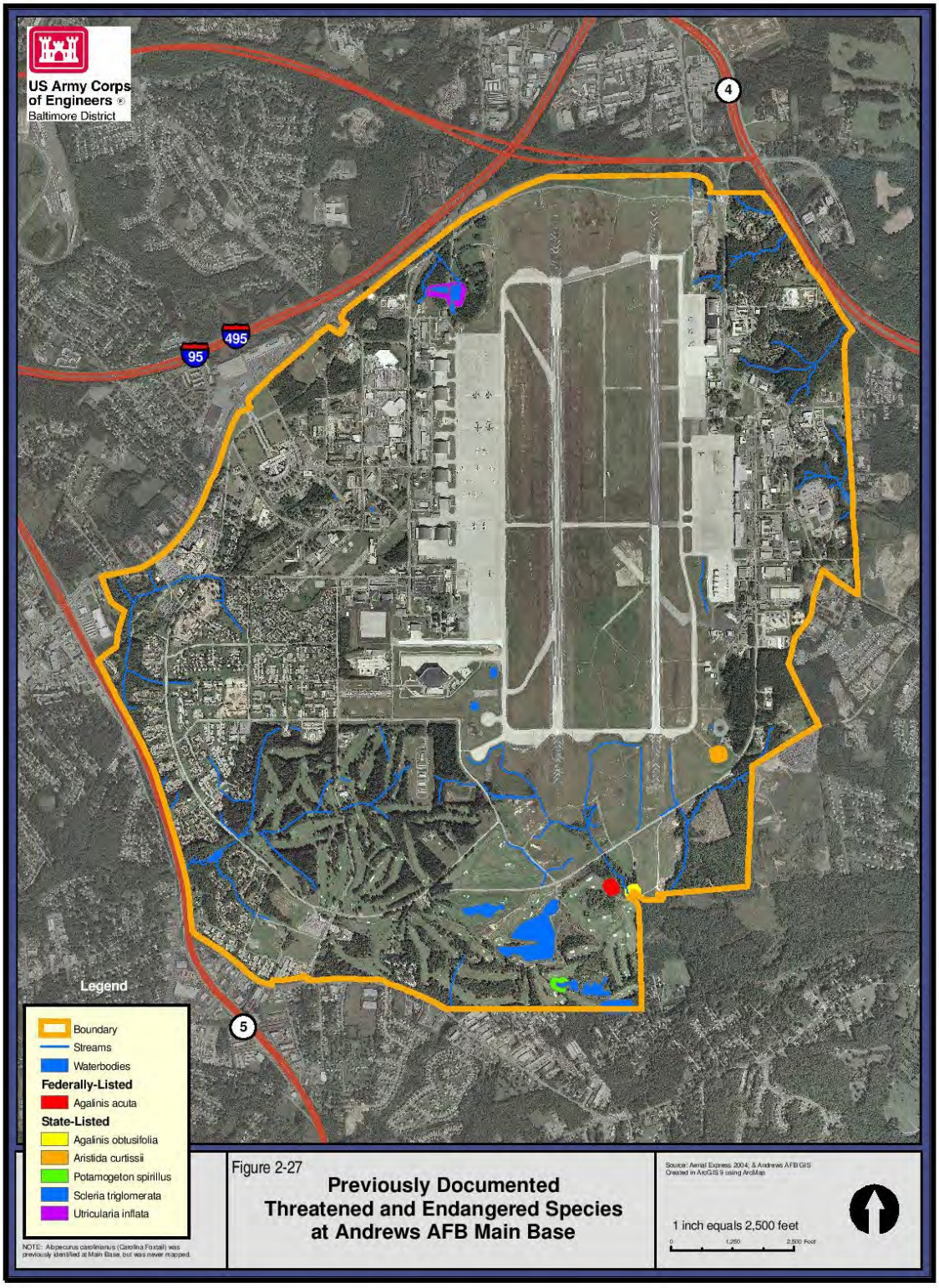

Figure 32. Previously documented RTE species at JBA Main Base. Figure from the 2007 INRMP (JBA, 2007).

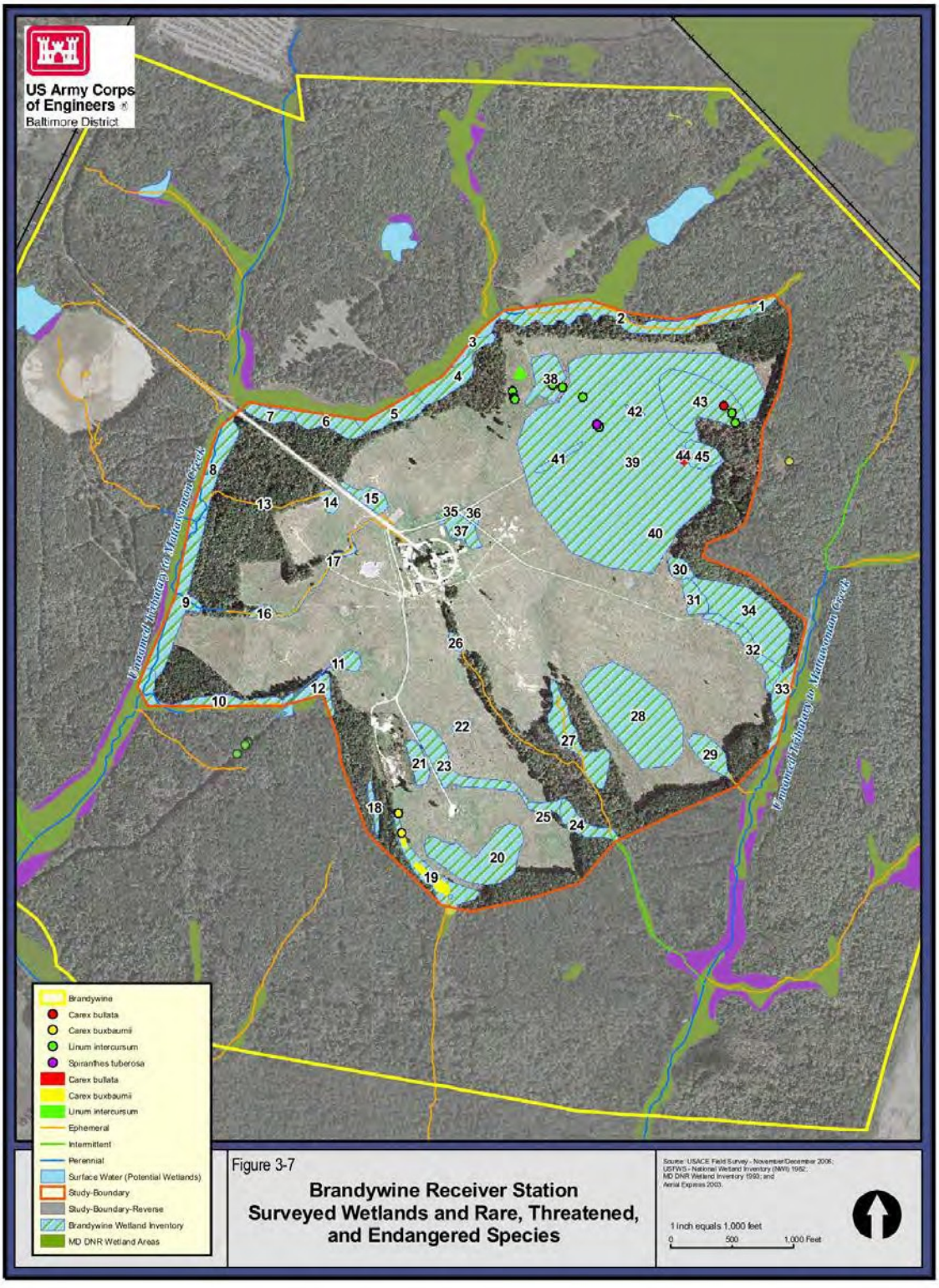

Figure 33. Previously documented RTE species at the Brandywine GSU. Figure from the 2007 wetland survey of the Brandywine and Davidsonville GSUs (USACE, 2007).

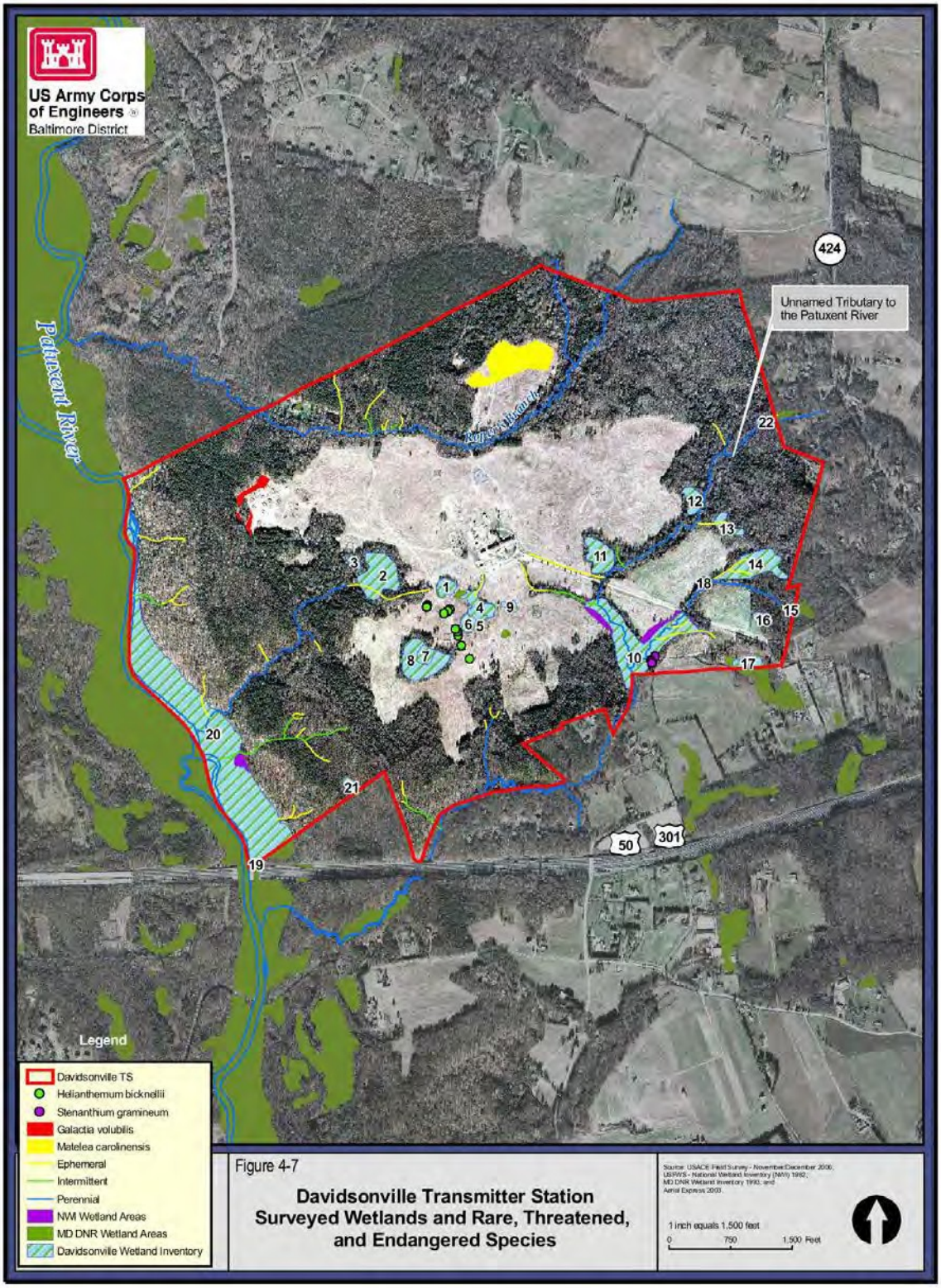

Figure 34. Previously documented RTE species at the Davidsonville GSU. Figure from the 2007 wetland survey of the Brandywine and Davidsonville GSUs (USACE, 2007).

2.3.5 Wetlands and Floodplains

2.3.5.1 Wetlands

Several wetland surveys have been conducted at JBA, many of which have delineated varying totals and locations of wetlands as discussed in Section 2.2.4.3.

Wetland surveys have previously been conducted at JBA Main Base in 1997, 2004, 2006, 2010, 2012, 2013 and 2016. A wetland survey was conducted by IT Corporation in 1997 (Andrews AFB, 1997). A formal jurisdictional delineation of wetlands was performed by J.M. Waller and Associates in March 2004 (Andrews AFB, 2004). The 2004 survey identified 87.2 acres of jurisdictional wetlands on the Main Base, of which approximately 36 acres were palustrine forested (PFO) wetlands and 31 acres were palustrine emergent (PEM) wetlands. The remaining 20.2 acres were palustrine open water (POW) habitats.

A wetland delineation was conducted in 2006 as part of the CWA permit process for construction of the South Golf Course on the Main Base. The delineation was limited in area to the project area and did not survey the entire Main Base. As part of that project, wetland mitigation was implemented through the restoration and enhancement of a wetland at a shallow pond near the southern border of the installation (JBA, 2007). In 2010 JBA received a jurisdictional determination (JD) for 24.6 acres wetlands delineated within the project area within the Pathfinder fence and 0.3 acres outside the Pathfinder fence for an improvement project at the West Runway. This JD expired in April 2015.

In July 2012, the USACE and EA Engineering, Science, and Technology conducted a wetland delineation survey of the nontidal wetlands and waterways within the active airfield at JBA (USACE, 2012). The project site was separated into seven distinct areas of review. The overall airfield consisted of approximately 1,800 acres located in Prince George's County, Maryland. The airfield is surrounded by a secured perimeter fence and can only be accessed with an escort through multiple entrances around the airfield off the surrounding perimeter road. Within the airfield, the wetland delineation on approximately 1,009 acres known as the areas of review.

The majority of the 45.17 acres of wetlands delineated within the airfield were identified as emergent wetlands within the limits of the active airfield (USACE, 2012). Some of these wetlands, particularly at the north end of the airfield, were created by failed stormwater management catch basins or culvert inlets. The dominant vegetation within the wetlands typically included soft rush (*Juncus effuses*), reed canary grass (*Phalaris arundinacea*), straw color flatsedge (*Cyperus strigosus*), yellow foxtail (*Setaria pumila*), and slender fimbry (*Fimbristylis autumnali*). Soil profiles were generally characterized as fine sandy clays overlain by loamy material with some organics. Typically the wetland soils identified within the areas of review consisted of an upper matrix color 10YR 5/1 with mottles present and indicators of water ponding at the surface. The primary hydrologic indicators included inundation, water marks, and saturation of the soils. A jurisdictional determination was issued by the USACE for this wetland delineation report for wetlands and waters within the airfield in 2014, which expires in 2019.

In 2013 the USACE and EA Engineering, Science and Technology completed a wetlands and waters delineation for the Main Base outside of the airfield, within survey areas A to J. This delineation identified 17.4 acres of wetlands and 2.6 acres of intermittent and perennial stream, but again surveyed only a portion of the Main Base (JBA, 2014d).

In 2014 JBA reviewed the status of existing wetlands surveys and jurisdictional delineations on the Main Base and prepared a Wetlands Factsheet (JBA, 2014d). Combining the different survey areas from wetland

surveys conducted up until that point indicated that the Main Base contained 150.9 acres of wetlands, with 69.0 acres inside the Pathfinder fence and 81.9 acres outside the Pathfinder fence (Table 9). The analysis of 150.9 acres of wetlands on the Main Base has been used in subsequent planning documents at JBA, including the IDP in 2016.

Since that time JBA conducted an update to the wetland and waters delineations for several discrete sections of the Main Base as part of the planning for the Presidential Aircraft Recapitalization (PAR) Program. The wetland delineation for the PAR study areas was performed during July and August 2016 in accordance with the *Corps of Engineers Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)*. The 2016 delineation of WUS for the PAR Environmental Impact Statement (EIS) project supplemented the existing JD by the USACE completed in March 2014 for another JBA project with a project area that overlaps a portion of the PAR EIS study area (JBA, 2017c).

The 2016 wetlands survey conducted for the PAR EIS updated the locations and boundaries of wetlands and waters in several areas on the Main Base, primarily at the southern end where the PAR Complex has been proposed to be constructed and existing facilities would be relocated. The updated total area of wetlands on the Main Base identified is 117.5 acres (Figure 21).

A new, comprehensive wetlands and waters delineation, with a JD, needs to be conducted on the Main Base to accurately locate and describe wetlands and waters for planning purposes and natural resources management. The collection of disparate surveys, each covering a different area and time period, on the Main Base impedes AF planning, regulatory permit preparation, and natural resources management, including BASH. The general incompatibility of airfields wetlands (JBA, 2016a) poses a continuing challenge for management of natural resources at JBA. Changing wetland conditions at the installation in both time and space hinder JBA's ability to balance natural resource protection with the military mission. A new updated wetlands delineation and JD would serve as a baseline wetlands inventory IAW AFI 32-7064 (Chapter 4, Part 4.1.1 *Baseline Wetlands Inventory*), with the JD valid for five years and applicable to proposed development activities on Base during that period.

Similar to the data gaps for wetlands status on the Main Base, the Brandywine GSU has non-definitive data on the abundance and distribution of wetlands. Wetland surveys at the Brandywine and Davidsonville GSUs were conducted in 1993 by Peddada Consultants, Inc. and Sheladia Consultants, Inc. (Andrews AFB, 1993). The 1993 wetland inventory at the Brandywine GSU did not cover the entire site but excluded the center field areas. The inventory identified 19 wetland areas at the Brandywine GSU totaling 381.59 acres. Approximately half of these sites were palustrine forested wetlands dominated by red maple, black gum, willow oak (*Quercus phellos)*, and sweetgum. These forested wetlands are concentrated along streams and drainageways, and many are believed to be only seasonally or intermittently wet. Large palustrine emergent wetlands have been created or enhanced by beaver activity. These emergent wetlands are dominated by spatterdock (*Nuphar luteum*) and soft rush (*Juncus effusus*) and are fringed by scrub-shrub and forested wetlands. The PSS wetland type is dominated by button bush and smooth alder.

Mapping is not available from the 1993 survey at Brandywine; therefore, the 2007 INRMP identified potential wetlands areas as indicated in the GSU Stormwater Assessment Report (USACE, 2006e), the National Wetland Inventory (NWI) Maps, and the MD DNR Wetland Mapping and recommended a planning-level survey to identify wetlands in the central portion of the GSU. NWI data indicated there were 67.77 acres of wetlands at the Brandywine GSU, while the MD DNR wetland data indicated 110 acres.

The USACE, on behalf of JBA, undertook a planning-level wetland survey at the Brandywine GSU in the fall of 2006 to update the 1993 surveys (USACE, 2007). The large grassy areas in the center of the installation were not mapped as wetlands during the 1993 survey, but the USACE (2007) wetland survey

focused on this area and excluded the perimeter forested areas because the open center area is the most likely to be developed by any future activities. USACE (2007) surveyed 410 acres at the center of the GSU, encompassing the non-forested field areas and its immediate fringe of forest. Within the 410-acre survey area, 123.1 acres of wetlands were identified (Figure 22). Wetlands at the Brandywine GSU in the USACE (2007) wetlands survey included 108.1 acres of predominantly PEM wetland, 3.3 acres of predominantly PSS wetland, 10.4 acres of predominantly PFO wetland, and 1.3 acres of PUB wetland. Some of the wetlands are Brandywine GSU are isolated while others are connected to streams or other wetlands (USACE, 2007), and others may connect to off-site wetlands based on the identification of wetlands surrounding the GSU in the NWI or by MD DNR.

The most comprehensive wetland surveys at JBA have been conducted at the Davidsonville GSU. The 1993 wetland inventory identified 15 wetland areas at the Davidsonville GSU (Andrews AFB, 1993). Most of these wetland areas are palustrine forested wetlands, and are dominated by red maple, willow oak, and sweetgum. As with the Brandywine GSU, most of these wetlands are concentrated along streams and drainageways, and many are only seasonally or intermittently wet. The 1993 wetland survey included the entire Davidsonville GSU.

Two ponded areas were also noted in the 1993 wetland inventory at Davidsonville. One was a shallow-water area identified as palustrine emergent wetland, and the other was a somewhat larger, deeper pond (POW) area with a PSS edge. These wetlands were dominated by soft rush, with spike rushes in the emergent wetland, and arrowwood along the edges of the pond wetland.

Mapping is not available from the 1993 survey at Davidsonville; therefore, JBA (2007) identified potential wetlands areas as indicated in the GSU Stormwater Assessment Report (USACE, 2006e), the NWI Maps, and the MDNR Wetland Mapping and recommended a planning-level survey to identify wetlands at the GSU.

The USACE undertook a planning-level wetland survey at the Davidsonville GSU in the fall of 2006 to update the 1993 surveys (USACE, 2007). USACE (2007) surveyed the entire 836 acres of the GSU. A total of 72.1 acres of wetlands were identified (Figure 23). Wetlands at the Davidsonville GSU in the USACE (2007) wetlands survey included 6.0 acres of predominantly PEM wetland, 4.2 acres of predominantly PSS wetland, 61.9 acres of predominantly PFO wetland, and 0.002 acres of PUB wetland. Some of the wetlands are Davidsonville GSU are isolated while others are connected to streams or other wetlands, and others are connected to off-site wetlands (USACE, 2007).

The 2007 wetland surveys at the Brandywine and Davidsonville GSUs are now outdated. An updated wetland survey that includes the entirety of both GSUs would not only update the status of wetlands on the GSUs but also resolve the challenge of integrating two wetland surveys (1993 and 2007) when the older of the two has no available maps to show its survey boundaries. Although the IDP does not identify any short-term development plans for either GSU, utilizing the Brandywine GSU for wetlands compensatory mitigation resulting from wetland impacts on the Main Base has been considered. JBA has had difficulty locating suitable off-site compensatory wetland mitigation sites, and an accurate, updated delineation of wetlands at the GSUs could provide valuable information on compensatory mitigation opportunities on AF property.

Based upon the series of wetland surveys at the Main Base and two GSUs, wetlands at JBA are generally of four types based on the classification system of the Federal Geographic Data Committee (FGDC), which is based on Cowardin et al. (1979): palustrine emergent wetlands (PEM), palustrine scrub-shrub wetlands (PSS), palustrine forested wetlands (PFO), and palustrine unconsolidated bottom (PUB). Table 9 provides a summary of each of these wetland types at the Main Base, Brandywine GSU and Davidsonville GSU.

Palustrine Emergent Wetlands

The emergent wetland community that is found at JBA is the palustrine persistent emergent subclass. These wetlands are found in areas on the golf course near the Base Lake (Freedom Lake) and at the southern end of the airfield (Table 9; Figure 21). At Brandywine GSU, PEM wetlands are found along streams and drainages as well as large areas of wet meadow within the non-forested fields surrounding the developed portion of the GSU; some of these wetlands are isolated but others are connected to streams or other wetlands (Table 9; Figure 22). At the Davidsonville GSU, predominantly PEM wetlands are found in seven small areas, often associated with other wetlands on-site and/or isolated from streams (Table 9; Figure 23). Plants found at these wetlands include broadleaf cattail (*Typha latifolia*), common rush (*Juncus effusus*), jewelweed (*Impatiens capensis*), buttonbush (*Cephalanthus occidentalis*), giant cane (*Arundinaria gigantea*), shallow sedge (*Carex lurida*), and seedbox (*Ludwigia* spp.). Black willows (*Salix nigra*) are found on the outskirts of emergent wetlands.

Palustrine Scrub-Shrub Wetlands

Palustrine scrub-shrub wetlands at JBA are of the broad-leaved deciduous subclass. This community is found at various locations around the Base Lake (Freedom Lake) golf course (Table 9; Figure 21). At Brandywine GSU, PSS wetlands are found along streams and drainages (Table 9; Figure 22). At the Davidsonville GSU, predominantly PSS wetlands often are found in association with other wetlands, including with one complex of wetlands that is fed by stormwater runoff from the developed area in the center of the GSU (Table 9 and Figure 23; USACE, 2007). Common plants include sweetbay (*Magnolia virginiana*), southern arrowwood (*Viburnum dentatum*), black willow, highbush blueberry (*Vaccinium corymbosum*), red maple, and sweetgum as well as herbaceous species jewelweed and cinnamon fern (*Osmunda cinnamomea*).

Palustrine Forested Wetlands

The forested wetlands at JBA are found throughout the Main Base (Table 9; Figure 21) and include dominant canopy species such as sweet gum, red maple, tulip poplar, and black gum. The understory consists of silky dogwood (*Cornus amomum*), American holly and sweetbay. Common herbaceous species include common lady's fern (*Athyrium filix-femina*), smallspike false nettle (*Boehmeria cylindrica*), netted chain fern (*Woodwardia areolata*), jewelweed, Virginia water horehound (*Lycopus virginicus*) and seedlings of the overstory species. At Brandywine GSU, PFO wetlands are located along streams and drainages (Table 9; Figure 22). At the Davidsonville GSU, PFO wetlands are the predominant wetland type and are also found along streams and drainages, with the largest located along the floodplain of the Patuxent River (Table 9; Figure 23).

Palustrine Unconsolidated Bottom

Palustrine unconsolidated bottom wetlands "includes all wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent" (FGDC, 2013, p. 22). The wetlands may be subtidal, permanently or semi-permanently flooded or intermittently exposed, and they may have very unstable substrates that may hinder plant and animal attachment. The substrates may consist of cobbles, gravel, sand, mud or organic material (FGDC, 2013). PUB wetlands are formed by the nature or the land and topography, and they may be formed by excavation in some cases (USACE, 2007). At JBA Base Lake and other ponds, both on the Main Base and at the two GSUs, including those created or enhanced by beaver activity, are classified as PUB wetlands (Table 9; Figures 21-23). The PUB wetland identified at Davidsonville GSU is connected to a wetland off-site with only a small portion (0.002 acres) located on the GSU (Table 9). In some of the older wetland survey at JBA, these wetlands may be referred to as palustrine open water (POW).

JBA wetlands are threatened by development pressures and invasive species at the Main Base. The 2004 jurisdictional delineation at the Main Base identified tree-of-heaven, mile-a-minute, kudzu, bamboo,

Japanese honeysuckle, multiflora rose and common reed as common invasive species threatening wetlands at JBA.

Existing information on wetland types and acreages is provided in Table 9 below.

Table 9. Summary of wetlands within JBA.

Community Type	Acreage	Comments
Main Base [1]		
Palustrine Forested Wetland (PFO)	31.4	Scattered throughout the Military Family Housing Area and near the North Gate; Concentrated along streams and drainageways; Most common species are sweet gum, red maple and willow oak.
Palustrine Scrub/Shrub Wetland (PSS)	6.3	Located in more open areas and in parts of the airfield.
Palustrine Emergent Wetland (PEM)	41.0	Dominate the Base Lake area; Large, open wetland areas have developed on the east side of the Base near the perimeter fence; Most common species are soft rush and grasses.
Palustrine Unconsolidated Bottom (PUB)	33.96	Includes Base Lake, ponds at Belle Chance, and ephemeral streams.
TOTAL	**150.96**	
Brandywine Receiver Station [2]		
Palustrine Forested Wetland (PFO)	Up to 198.18	Concentrated along streams and drainageways, and many areas are believed to be only seasonally or intermittently wet; Dominated by red maple, black bum, willow oak (*Quercus phellos)*, and sweetgum.
Palustrine Scrub/Shrub Wetland (PSS)	Up to 6.62	Dominated by button bush and smooth alder
Palustrine Emergent Wetland (PEM)	Up to 296.71	Large PEM wetlands created or enhanced by beaver activity; Dominated by spatterdock (*Nuphar luteum*) and soft rush (*Juncus effusus*).
Palustrine Open Water (POW)	Up to 3.18	--
TOTAL	**Up to 504.69**	
Davidsonville Transmitter Station [3]		

Palustrine Forested Wetland (PFO)	61.9	Concentrated along streams and drainageways; Many are only seasonally or intermittently wet; Dominated by red maple, willow oak, and sweetgum.
Palustrine Scrub/Shrub Wetland (PSS)	4.2	Located at edge of POW wetland.
Palustrine Emergent Wetland (PEM)	6.0	Ponded, shallow-water area; Dominated by soft rush with spike rushes.
Palustrine Open Water (POW)	0.002	Larger, deeper pond with PSS edge.
TOTAL	**72.102**	

Source Notes:
1: Data from JBA (2014d), which does not include updated data from the PAR EIS (JBA, 2017c).
2: Data derived from adding JBA (2007) and Andrews AFB (1993), which have an unknown level of overlap.
3: Data from USACE (2007).

2.3.5.2 Floodplains

Comprehensive and current floodplain information for JBA is limited. Available FEMA flood zone maps for the area surrounding the Main Base only partially extend onto the Main Base in two areas, along the drainages of Piscataway Creek at the southeast end of the installation and along Meetinghouse Branch on the west (Hanif et al., 2018). In 2005 a draft floodplain analysis was conducted at JBA, which the USACE incorporated into the 2007 INRMP. Both the 100-year and 500-year floodplains were assessed on the Main Base. The floodplains again were located along water courses, including those of Meetinghouse Branch, Paynes Branch, Piscataway Creek, and very small portions of the tributaries to Charles and Hanson Creeks (see JBA, 2007, Figure 2-24). Hanif et al. (2018, p. 9) found that the available floodplain area data for the JBA Main Base was either outdated or "cannot be reasonably determined."

At the Main Base, a preliminary 100-year floodplain analysis was recently conducted as part of a pilot study using newly developed standardized techniques for military installations (see Section 2.2.4.4). Preliminary results from this pilot study are under review.

At the Brandywine and Davidsonville GSUs, data on the 100-year floodplain are limited to FEMA floodplain data that Hanif et al. (2018) found to be outdated and of limited use for planning purposes. The floodplains at both GSUs are undeveloped and located along water courses. At the Brandywine GSU, the only mapped floodplain is along the unnamed tributary to Mattawoman Creek on the west side of the station, an area that is nearly completely forested (Figure 25). At the Davidsonville GSU, the only mapped floodplains are along the Patuxent River on the west side of the GSU, an area that contains forested wetlands (Figure 26).

The Brandywine GSU is located entirely within the Mattawoman Creek watershed, for which a watershed management plan has been prepared (USACE, 2003). The Mattawoman Creek Watershed Management Plan describes the biological communities in the riparian corridor, with deteriorating conditions near the headwaters, where the Brandywine GSU is located, due to proximity to development that has replaced wetland and forest buffers in the floodplain. Most of Mattawoman Creek's floodplain is low bottomland

forest with non-tidal wetlands. The watershed management plan recommends the protection of wetland complexes in the Mattawoman Stream Valley to provide effective sediment and nutrient buffers for contaminates (USACE, 2003).

The floodplain area analyses for both GSUs should be updated using the methodology developed by Hanif et al. (2018) for the Main Base, allowing JBA to have the most accurate and current information on the location and extend of floodplain areas for planning and natural resource management purposes throughout the installation. The SDI for Climatic Vulnerability at JBA found the installation has a high vulnerability to flooding and that measures should be taken to reduce flood hazards (JBA, 2016a). Comprehensive, current floodplain analyses would assist JBA in mitigating the risks to the installation and the military mission from flooding.

2.3.6 Other Natural Resource Information

Prince George's County has identified Woodland Conservation Areas where forested areas have been protected IAW the county's Woodland and Wildlife Habitat Conservation Ordinance. A number of these Woodland Conservation Areas border the Brandywine GSU on adjacent properties. Because the Davidsonville GSU is located in Anne Arundel County, only a few small Woodland Conservation Areas have been protected across the Patuxent River in Prince George's County. In 2016 a 14.4-acre Woodland Conservation Area was approved on property adjacent to the southeast edge of the Main Base near Foxley Road. Property adjacent to the Pearl Harbor Gate is also an approved Woodland Conservation Area. Across Pennsylvania Avenue from the Main Base, Westphalia Town Center has placed over 250 acres in the Woodland Conservation Area program. The Wesson Drive Woodland Conservation Bank, a mitigation bank for forest impacts, is located across the Capital Beltway from the northwest edge of the Main Base. When the Arbor Plan is updated, it should evaluate whether the forests at JBA should be designated Woodland Conservation Areas with Prince George's County.

2.4 Mission Impacts on Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

In accordance with AFI 32-7062, *Comprehensive Planning*, geospatial data are available to illustrate potential environmental constraints for future development and mission expansion at JBA. Potential natural resources constraints include critical habitat for threatened and endangered species, wetlands, floodplains, sensitive plant communities, highly erodible soils and steep slopes. At JBA data layers are available for each of these potential constraints, although there is currently no critical habitat for threatened and endangered species and floodplain data are limited.

The IDP defines three levels of on-Base planning constraints to development at JBA (JBA, 2016a):

- **Major Constraint**: Certain types of development are prohibited in affected areas.
- **Minor Constraint**: Development permitted in affected areas with consideration / mitigation.
- **No Constraint**: Not a constraint to development.

The IDP evaluated operational planning constraints, built planning constraints, and natural and environmental planning constraints. Operational planning constraints address explosive safety zones, airfield clearance / AICUZ, and antiterrorism / Force protection (AT/FP). Built planning constraints relate to cultural and historical resources. Airfield clearance / AICUZ pose a major constraint at JBA due to the

inclusion of 150 acres outside the Base boundary within the primary surface and clearance zones and the presence of private development within incompatible noise contours. Several major development projects planned in the vicinity of JBA will have a major bearing on future land use in the vicinity of the Base (JBA, 2016a).

Natural and environmental planning constraints are evaluated for wetlands and floodplains, BASH, Environmental Restoration Program (ERP), T&E, soils and geology, and topography and physiology (JBA, 2016a). There are no major natural and environmental constraints at JBA. Minor natural and environmental constraints include wetlands and floodplains, BASH, ERP, and soils and geology. T&E and topography and physiology pose no constraints. Natural and environmental constraints at the Main Base are presented in Figure 35.

Wetlands were found to be a minor constraint due to an existing and increasing need for wetland mitigation. Due to airfields and wetlands being incompatible land uses, wetlands were found to be a major constraint within the airfield. The IDP anticipates that more than 60 acres of jurisdictionally determined wetlands will require mitigation for future development plans on the airfield.

BASH is also a minor natural and environmental constraint at the Main Base due to the installation's location in an area of high bird strike potential in the Atlantic Migratory Flyway (JBA, 2014a, 2016a). Wildlife aircraft strikes have the potential to impact Base operations. Bird habitat surrounding the airfield is managed to reduce wildlife attractants and BASH potential.

The ERP on the Main Base addresses the cleanup of contamination and damage resulting from past DoD activities. Historical methods of hazardous waste disposal at JBA have resulted in contamination of surface waters, groundwater and soils. JBA was listed on the National Priorities List in 1999. As of 2016 153.7 acres of the installation were identified at 60 ERP sites. ERP sites are in various stages of study and remediation, with 29 sites no further action planned (JBA, 2016a).

Soils and geology also pose a minor planning constraint due to the presence of hydric and erodible soils. Hydric soils are generally characterized as either having a slow permeability or "poor to very poor" drainage class. A hydric soil formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Erodible soils can present challenges for natural resources management due to their susceptibility to creation of windthrows and gullies and susceptibility to erode into streams creating turbidity, sedimentation, and associated problems. Hydric soils also represent a significant construction issue. For example, both the Ambulatory Care Clinic and the future Presidential Aircraft Recapitalization (PAR) hangar are faced with significant foundation issues and associated costs (JBA, 2016a). Approximately 1,825 acres of the installation are classified as very limited or somewhat limited by hydric and/or erodible soils, with 605.6 acres very limited and 1,219.3 acres somewhat limited. This represents roughly 41% of the Main Base.

Both GSUs are constrained by the presence of wetlands, threatened and endangered species, and ERP sites. In addition, operations require a line of sight corridor, with associated height restrictions. The height of structures under the corridor must be restricted so that they do not penetrate the transmission line-of-sight. Residential zoning categories for Prince George's County include height restrictions; however, commercial and industrial zones do not. JBA should work with Prince George's County Planning Department to incorporate a maximum height restriction for industrial and commercial zones that will protect the installation's microwave communications relay line-of-sight corridor requirements. Natural and environmental constraints at the Brandywine GSU are shown in Figure 36 and at the Davidsonville GSU in Figure 37.

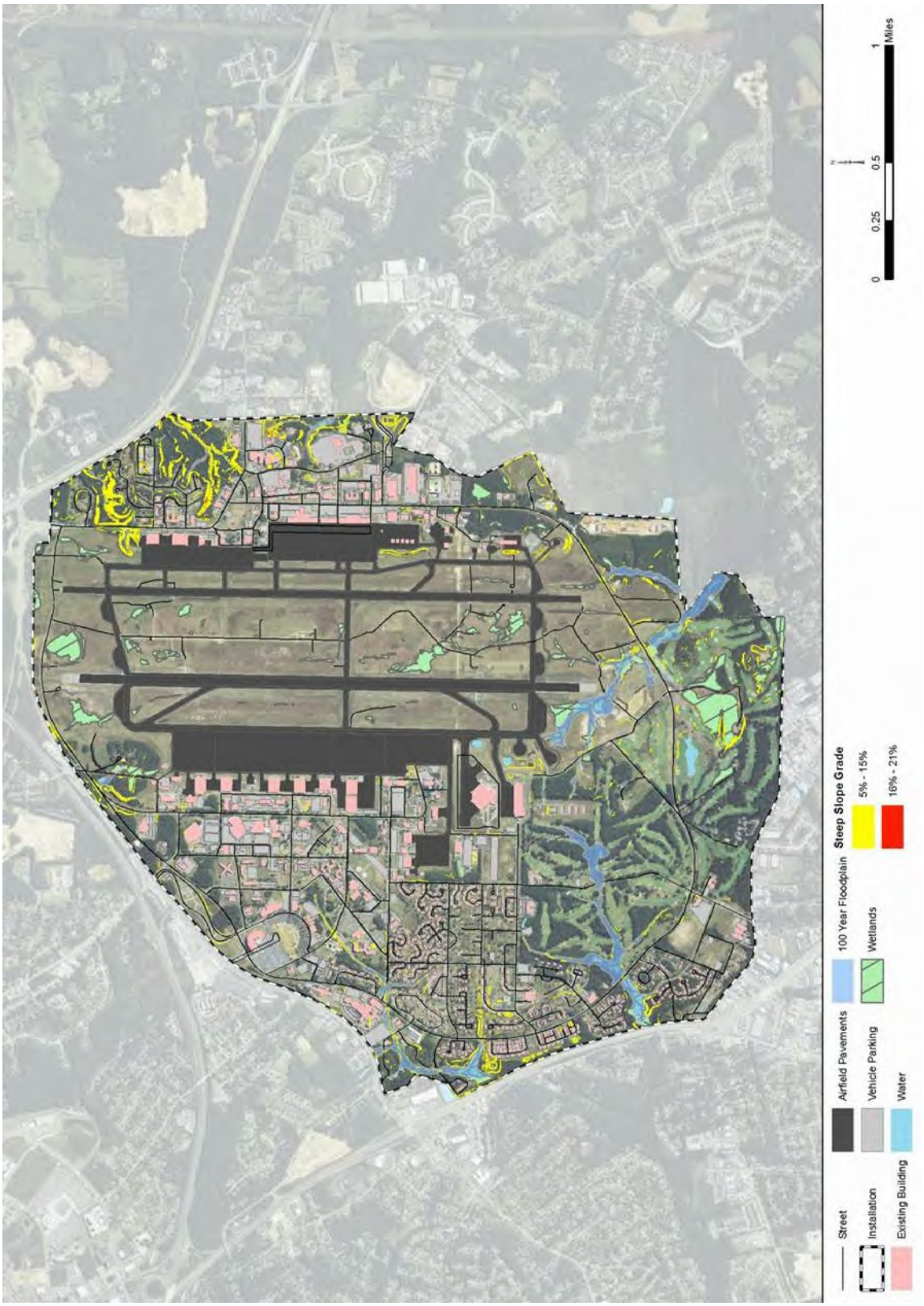

Figure 35. Environmental constraints at JBA Main Base. Figure from JBA (2016a).

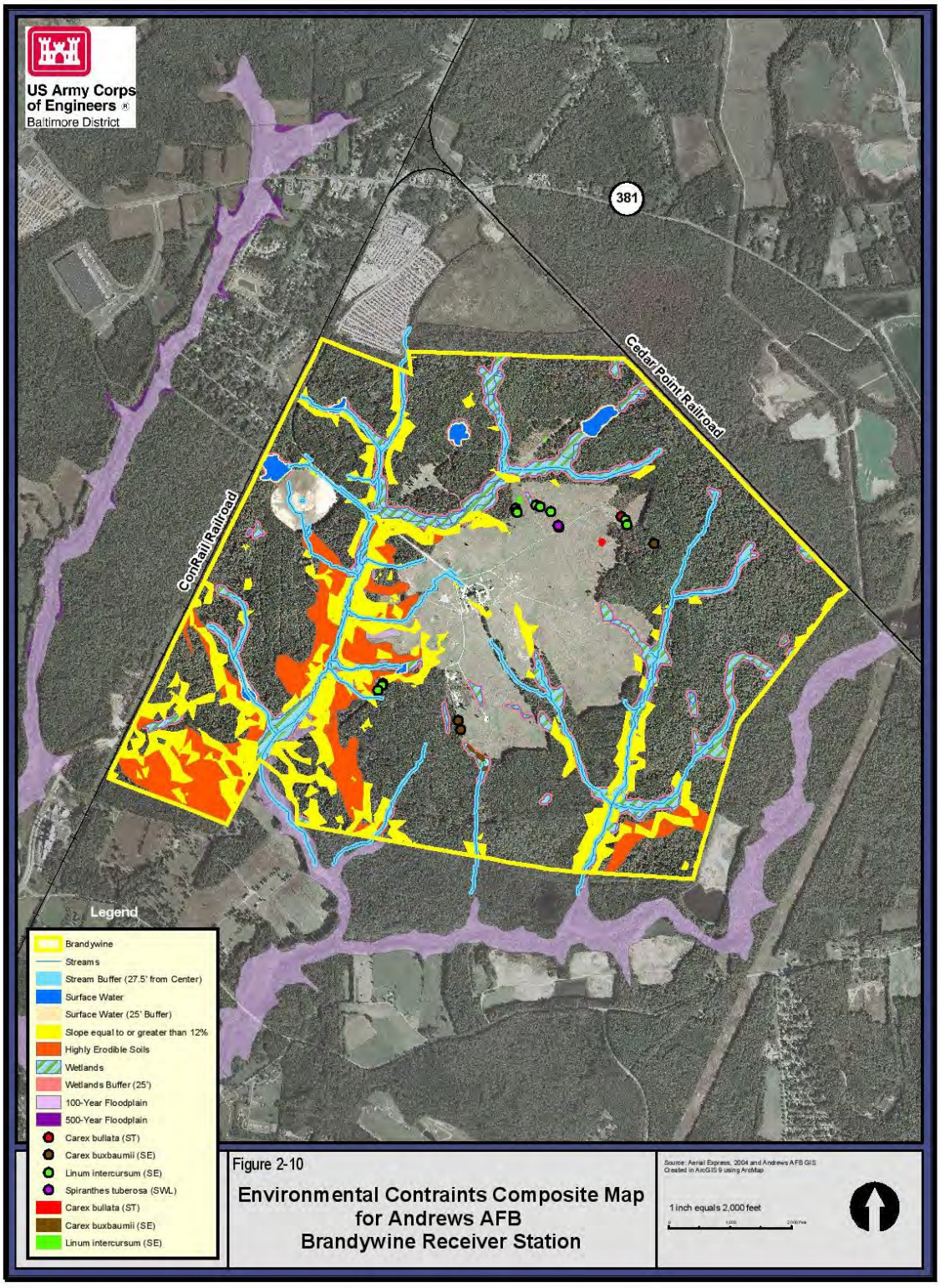

Figure 36. Environmental constraints at the Brandywine GSU. Figure from the 2007 INRMP (JBA, 2007).

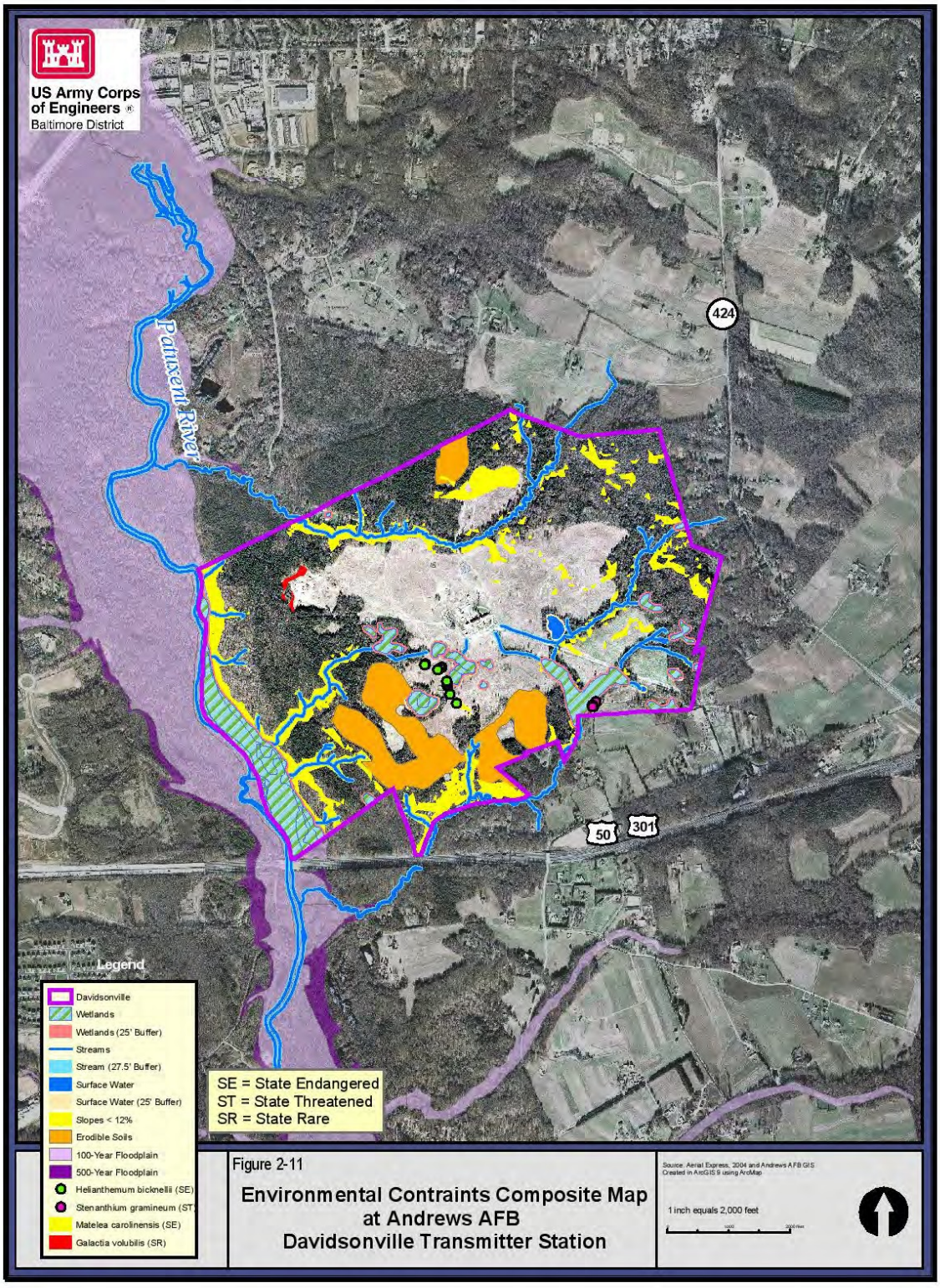

Figure 37. Environmental constraints at the Davidsonville GSU. Figure from the 2007 INRMP (JBA, 2007).

2.4.2 Land Use

The Main Base includes an airfield and extensive support facilities. The Base is divided into western and eastern sections containing mission and administrative facilities; the sections are separated by an airfield that is oriented north-south. The airfield includes two active runways that are 9,300 and 9,755 feet long, two mass aircraft parking aprons (west and east), and a network of parallel and connecting taxiways. The western portion of the Main Base is the larger land area, with community facilities (including commercial services), a medical center, housing, a large outdoor recreation/golf course facility, residential units and administrative uses. The majority of the industrial uses are located in the eastern portion of the Base. JBA has approximately 105 miles of paved roads.

The Main Base of JBA is 4,903.41 acres, with land uses data available for 4,402.6 of those acres (Table 10). The Main Base is divided into nine land use categories: administrative, aircraft operations and maintenance, airfield, community, housing, industrial, medical, open space and outdoor recreation (JBA, 2016a). These land use types are illustrated on Figure 38. The airfield land use area comprises over a third of the Main Base, with open space (19%) and outdoor recreation areas (17%) the second and third largest land uses respectively.

Table 10. Land uses at JBA Main Base.

Land Use Category	Acres	Percentage
Administrative	154.4	4
Aircraft Operations and Maintenance	366.3	8
Airfield	1,525.4	35
Community	136.7	3
Industrial	150.4	3
Medical	47.0	1
Open Space	818.0	19
Outdoor Recreation	768.4	17
Residential	436.1	10
TOTAL	**4,402.6**	**100**

Source: JBA (2016a)

Operations at the 1,640-acre Brandywine GSU support communication systems for the President of the United States, DoD, Department of State, and other critical government missions. Brandywine Station is comprised of forest and open space, along with limited development. Approximately 75 percent of the site is forested, 20 percent is open space (grasslands), and five percent is developed. Land uses at the Brandywine GSU are shown in Figure 39.

The Davidsonville GSU provides high frequency transmitter support to various civilian and military communications systems in the NCR, at JBA, and to deployed military units nationwide. Approximately 95 percent of the 864 acres of land at the Davidsonville Transmitter Station is wooded or grassland. The remaining five percent contains a small number of buildings and parking areas. The site is bordered by the Patuxent River on the west, Patuxent River Park and light residential to the north, Patuxent River Park to the south, and light residential development on the east. The Air Force uses the grassland areas at Davidsonville Transmitter Station for navigation and field communications training periodically. Additionally, a section of grassland is designated as a medical unit training site. These training activities do not involve heavy equipment, firearms, ordnance, fueling, or other potentially environmentally harmful activities. At this time there are no plans by the AF to develop any of the land at this location. Land uses at the Davidsonville Transmitter Station are shown in Figure 40.

Both the Davidsonville and Brandywine Stations have landing zones and facilities to support helicopter training operations.

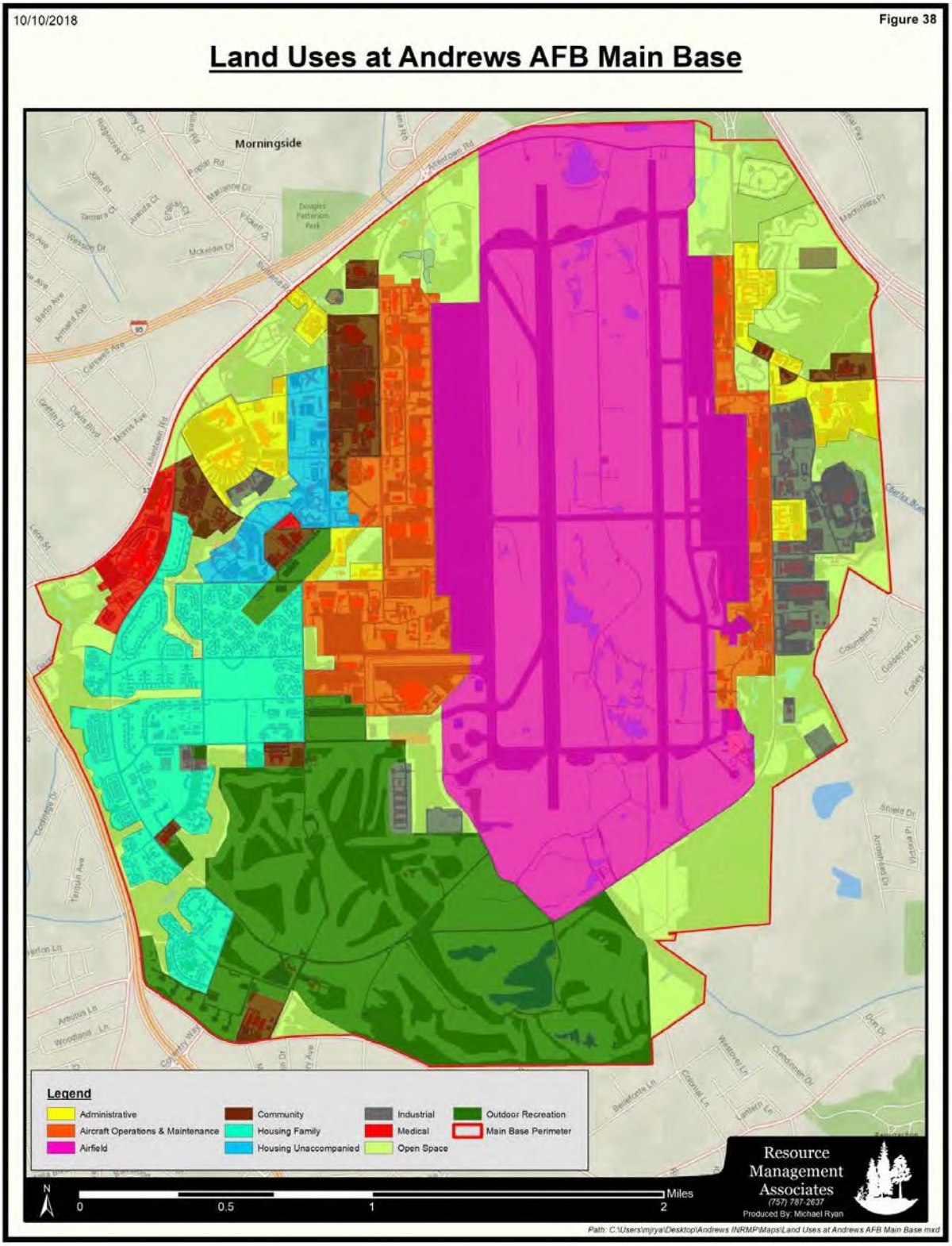

Figure 38. Land uses at JBA Main Base.

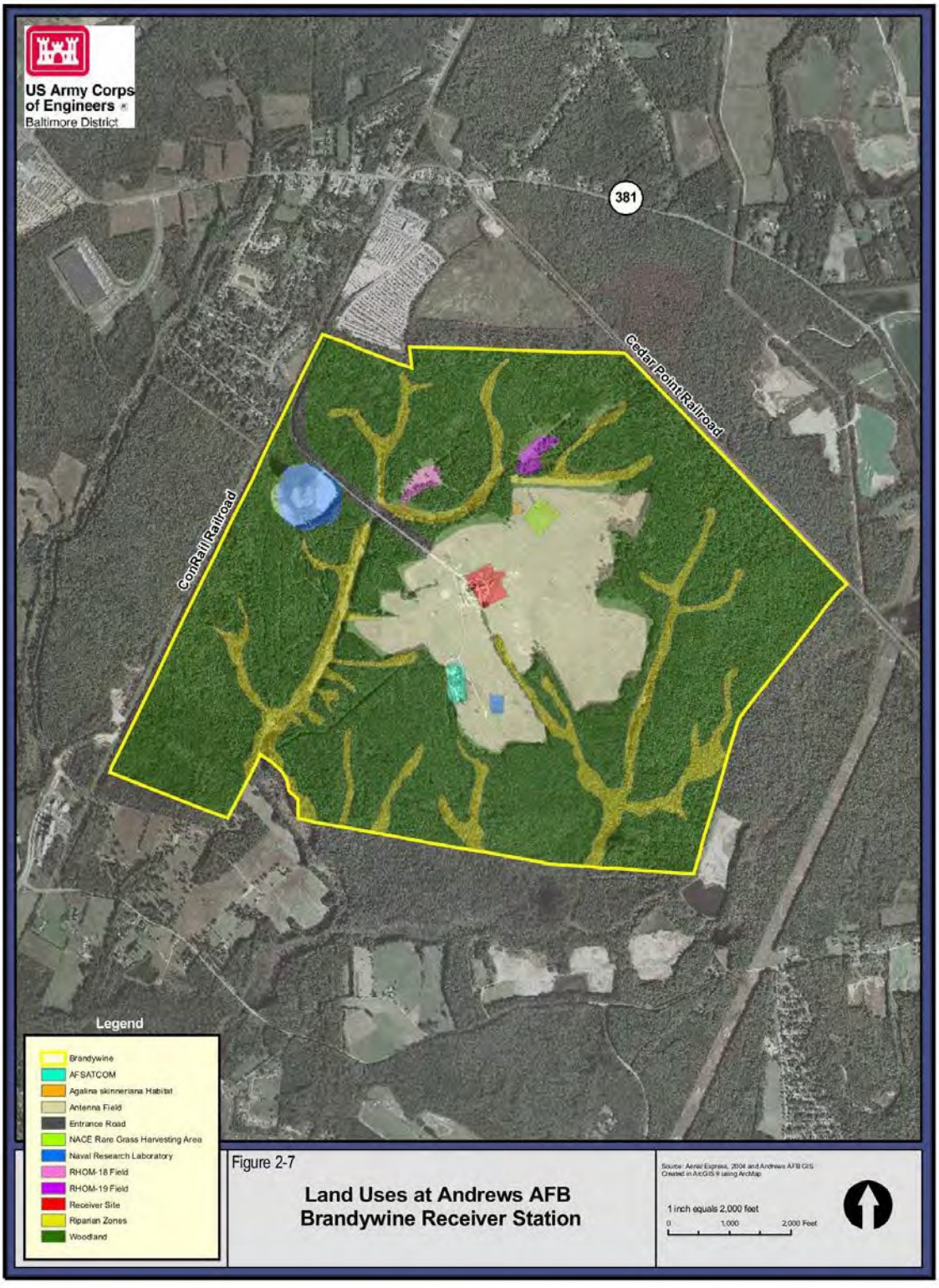

Figure 39. Land uses at the Brandywine GSU. Figure from the 2007 INRMP (JBA, 2007).

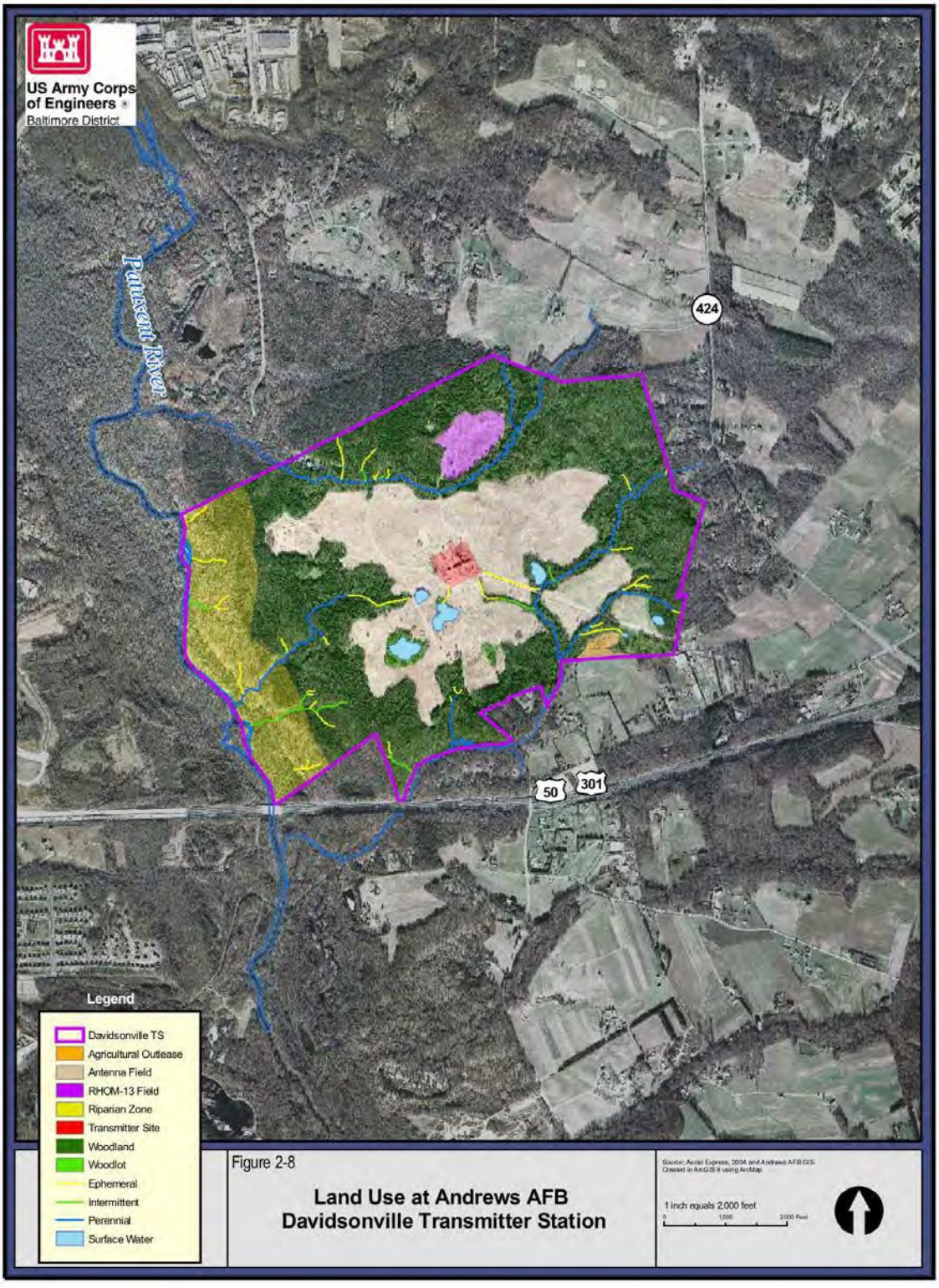

Figure 40. Land uses at the Davidsonville GSU. Figure from the 2007 INRMP (JBA, 2007). Note that the agricultural outlease has expired and has not been renewed.

2.4.3 Current Major Impacts

The 2017 AICUZ Study for JBA reaffirms Air Force policy of assisting local, regional, state, and federal officials in the areas neighboring JBA by promoting compatible development within the AICUZ area of influence while protecting Air Force operational capability from the effects of land use that are incompatible with aircraft operations. Specifically, the report documents changes in aircraft operations since the last study, which was conducted in 2007, and provides noise contours and compatible use guidelines for land areas neighboring the installation based on the 2016 operations (JBA, 2017b).

Initiated in 2008, the Joint Base Andrews Naval Air Facility Washington JLUS Program represents a partnership between the Base, Prince George's County, and the local community that facilitates a cooperative approach to development policy for the JBA vicinity. The JLUS identifies encroachment issues that impact both the Base and the communities around the Base, and recommends strategies to address these impacts. Strategies are intended to balance the needs of the Base with the long-term development plans and economic viability of the surrounding communities. One of the plan's goals is to address encroachment issues, including noise, traffic, pollution, and impacts on environmental and cultural resources (MNCPPC, 2009).

An Installation Complex Encroachment Management Action Plan was developed for JBA in 2012 (JBA, 2012). The ICEMAP addresses current and future encroachment and sustainment challenges facing JBA and the surrounding communities.

The SWMP and SWPPP describe sources of water pollution and BMPs to alleviate potential water quality impacts at JBA (JBA, 2017a, 2015a). The BASH Plan describes vegetation management needs to support airfield operations at JBA (JBA, 2014a). The DoD has a Memorandum of Understanding (MOU) with the State of Maryland regarding federal consistency requirements of the CZMA (DoD and MD, 2003; Appendix B). The MOU outlines the process by which DoD installations, including JBA, in Maryland comply with federal consistency determinations for coastal zone management. Most new projects at JBA must request a federal consistency determination from the State of Maryland under the CZMA; the MOU includes an attached list of *de minimis* and environmentally beneficial activities that do not require federal consistency determinations (Appendix B).

JBA has a Memorandum of Agreement (MOA) with the NPS and the Maryland State Historic Preservation Office (MD SHPO) regarding vegetation management in the Suitland Parkway corridor that impacts flight operations (USAF et al., 2003; Appendix C). Tree trimming and removal periodically occurs at the Main Base, as needed, to remove obstructions from the imaginary surfaces for both runways.

The ERP manages contamination at 60 sites at JBA, covering 249 acres (JBA, 2016a). All ERP sites and restrictions at JBA are identified in the IDP. ERP sites on the Main Base include former landfills, former shooting ranges, former underground storage tanks, the sites of former spills and other contaminant sources (Figure 42; also see Figure C-12 of the IDP). Six of the ERP sites on the Main Base are part of the Military Munitions Response Program (MMRP) as of January 2018 (JBA, 2018c).

Three of the ERP sites at the Main Base have potential ecological impacts of particular concern for this INRMP. Landfill 06 (LF-06) is a former 11-acre landfill that was located immediately adjacent to the south end of the West Runway. The landfill was operational in the 1950s and 1960s and was used primarily for construction debris and miscellaneous household and commercial waste. A former Defense Reutilization and Marketing Office (DRMO) is located on the same site. Piscataway Creek is immediately to the east and the ERP site drains to the creek. No leachate plumes were detected in 2009 but there is a potential ecological risk from contaminated subsurface soils. In 2013 JBA removed surface sediments at the former DRMO and lead and polycyclic aromatic hydrocarbons (PAHs) at Piscataway Creek. A remedial action

will be required to mitigate the impacts of metals in Piscataway Creek. The negative effects to the stream banks and natural resources caused by the implementation of a remedy may be offset by stream mitigation. The final Feasibility Study for LF-06 was underway in FY2018 (JBA, 2018c).

Landfill 07 (LF-07) is a former 28-acre landfill located immediately south of LF-06 and is under the golf course on the north side of Base Lake. LF-07 operated from the 1960s to the 1980s and received construction debris but also some chemical and household wastes. The ERP site drains to Piscataway Creek to the east. Additional wastes have been located north of Base Lake, immediately southwest of LF-07; the Base Lake North Area ERP site covers approximately 20 acres. The Base Lake North Area was a disposal site for general refuse and construction debris, operational from 1942 to 1955. A final Feasibility Study for LF-07 and Base Lake North Area ERP sites was underway in FY2018 to identify and evaluate a final remedy for adjacent Piscataway Creek and Base Lake. The final remedy may involve wetlands mitigation (JBA, 2018c).

A third ERP site on the Main Base with potential ecological impacts is the East Side Service Station (ERP Site ST-14). The former service station was near Fetchet Avenue in the northeast quadrant of the Main Base. An underground storage tank and ancillary piping system at Building 3487 leaked gasoline into the subsurface. In 1983 the underground storage tank was removed, and 20,000 gallons of gasoline were recovered from an excavation trench. Subsequent studies identified a commingled solvent plume extending from the flight line toward the northeast. A former hangar and vehicle wash rack were among several suspected sources for the solvent plumes. TCE and carbon tetrachloride that have been detected appear to originate from other sources to the west. The TCE plume has been confirmed to reach a tributary to Cabin Branch Creek. Concentrations detected in seeps into the creek were right at Maximum Containment Levels. The multiple contaminant source zones over many acres and large commingled solvent and petroleum constituent groundwater plumes under numerous buildings present technical challenges. In 2015 the Record of Decision (ROD) for ERP Site ST-14 was modified and remediation is on-going. Site closure is anticipated by 2040 or later (JBA, 2018c).

At the Brandywine GSU, there is one closed ERP site (Figure 43). ERP Site WP-16 was a former drum storage / waste accumulation point associated with a small building, Building 10. Former Building 10 served as a maintenance shop for lawn mowers and personal vehicles. Oil staining on the gravel and along the southern wall of Building 10 was observed in 1985, which resulted in opening the site for further investigations to determine the extent of contamination. No contamination above action levels was detected and the site was closed in 2007 (JBA, 2018c).

At the Davidsonville GSU, there is one ERP site (Figure 44). The Davidsonville Fuel Oil Spill (ERP Site SS-11) was discovered in 1984. A fuel oil spill has impacted the GSU, resulting from an underground storage tank and associated fuel lines, and more significantly, from nearby above ground storage tanks and fuel lines for the generator building. In 2002 the above ground storage tanks, fuel lines and all visibly contaminated soil was removed but some product saturated materials were under the east foundation of the generator building and could not be removed. A recovery well was installed to obtain product from the soils. Groundwater monitoring and an expanded site investigation starting in 2005 identified a plume of solvent contamination from trichloroethylene (TCE) and TCE degradation products. The solvent plume extends west of the building compound and across at least 17 acres of AF property. In February 2017 the Final ROD selected a remedy of injecting a mixture of several compounds to address the petroleum contaminants. The ERP site is sampled quarterly and anticipates a 20-year clean-up period (JBA, 2018c).

In addition to the above-mentioned programs at JBA, current environmental impacts have occurred to wetlands. In 2016 JBA entered into an agreement to purchase compensatory wetland and stream mitigation credits at the Piscataway Creek Mitigation Site in Clinton, Maryland (PCMS; Figure 45). The PCMS will provide mitigation credits for wetland impacts (12.5 acres) from a 2012 repairs project for the West

Runway. The PCMS will preserve 50.98 acres of non-tidal wetlands, create 9.27 acres, and restore 1.37 acres on Walton Farm along Piscataway Creek southeast of the Main Base. The total project area is 61.62 acres, which is equivalent to 12.5 wetland mitigation units. Upon completion of the wetland mitigation at PCMS, there will be a net ecological uplift of the project area (JBA, 2016c).

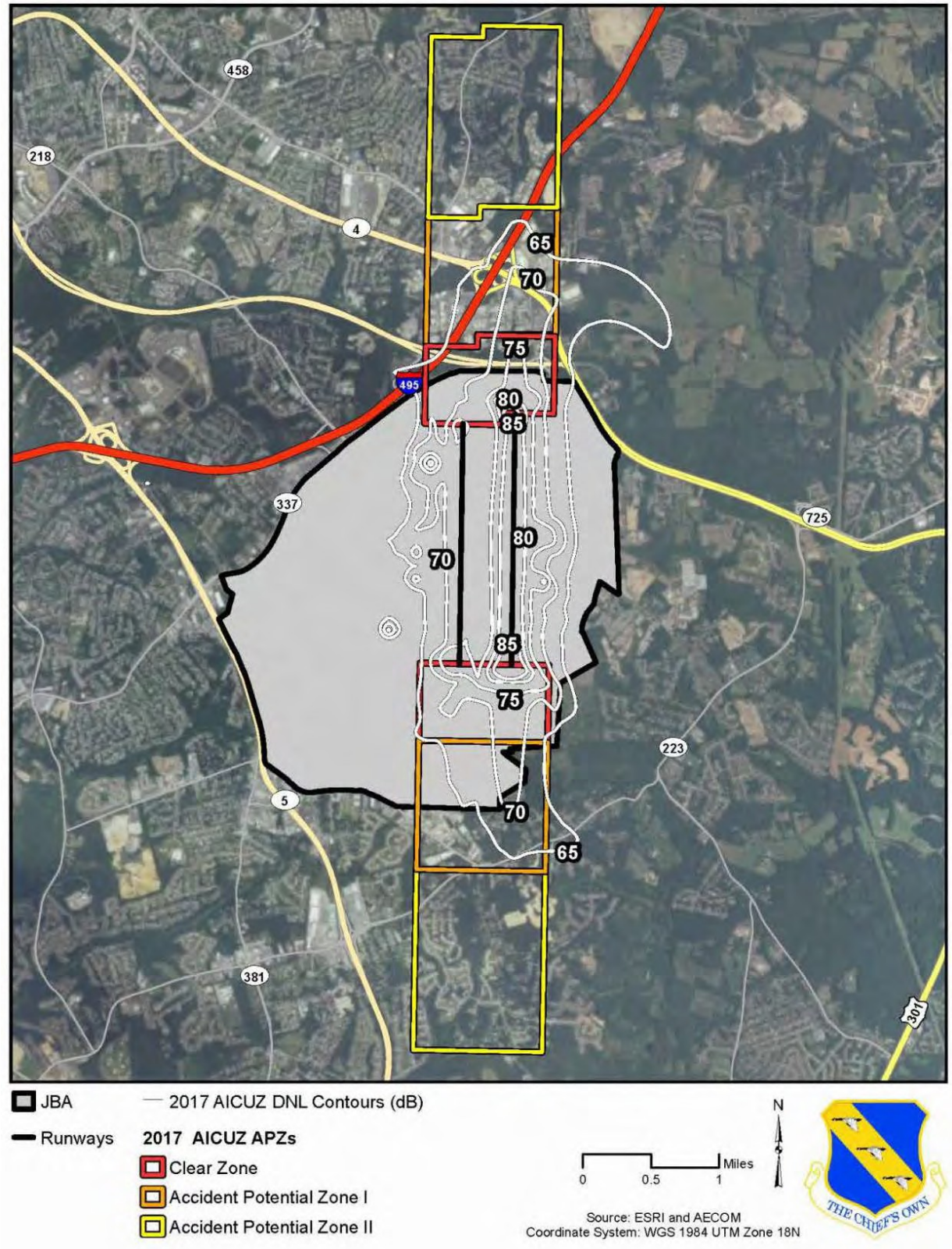

Figure 41. The Air Installation Compatible Use Zone (AICUZ) Area surrounding JBA Main Base. Figure from JBA (2017b).

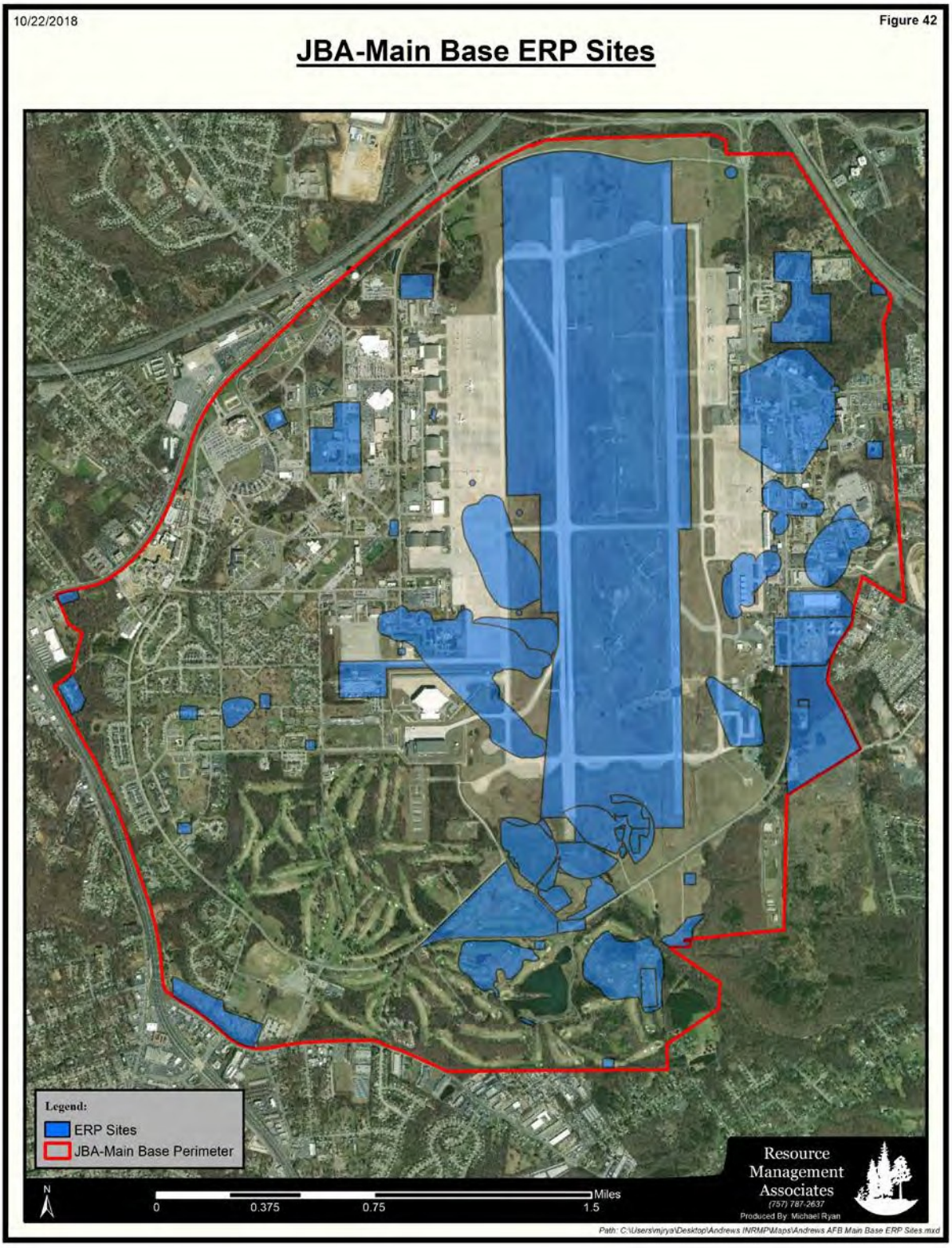

Figure 42. ERP sites at JBA Main Base.

Figure 43. ERP sites at the Brandywine GSU.

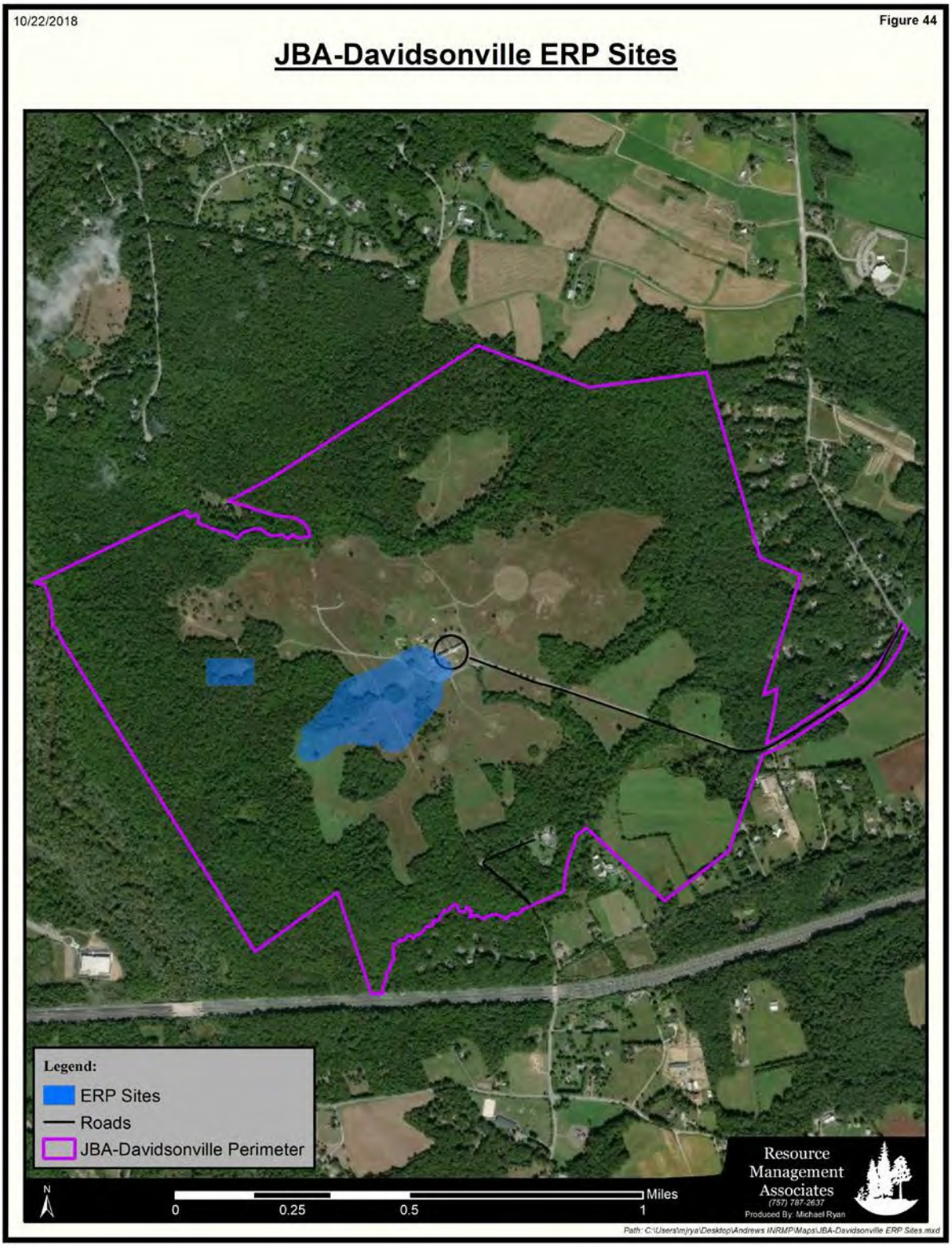

Figure 44. ERP sites at the Davidsonville GSU.

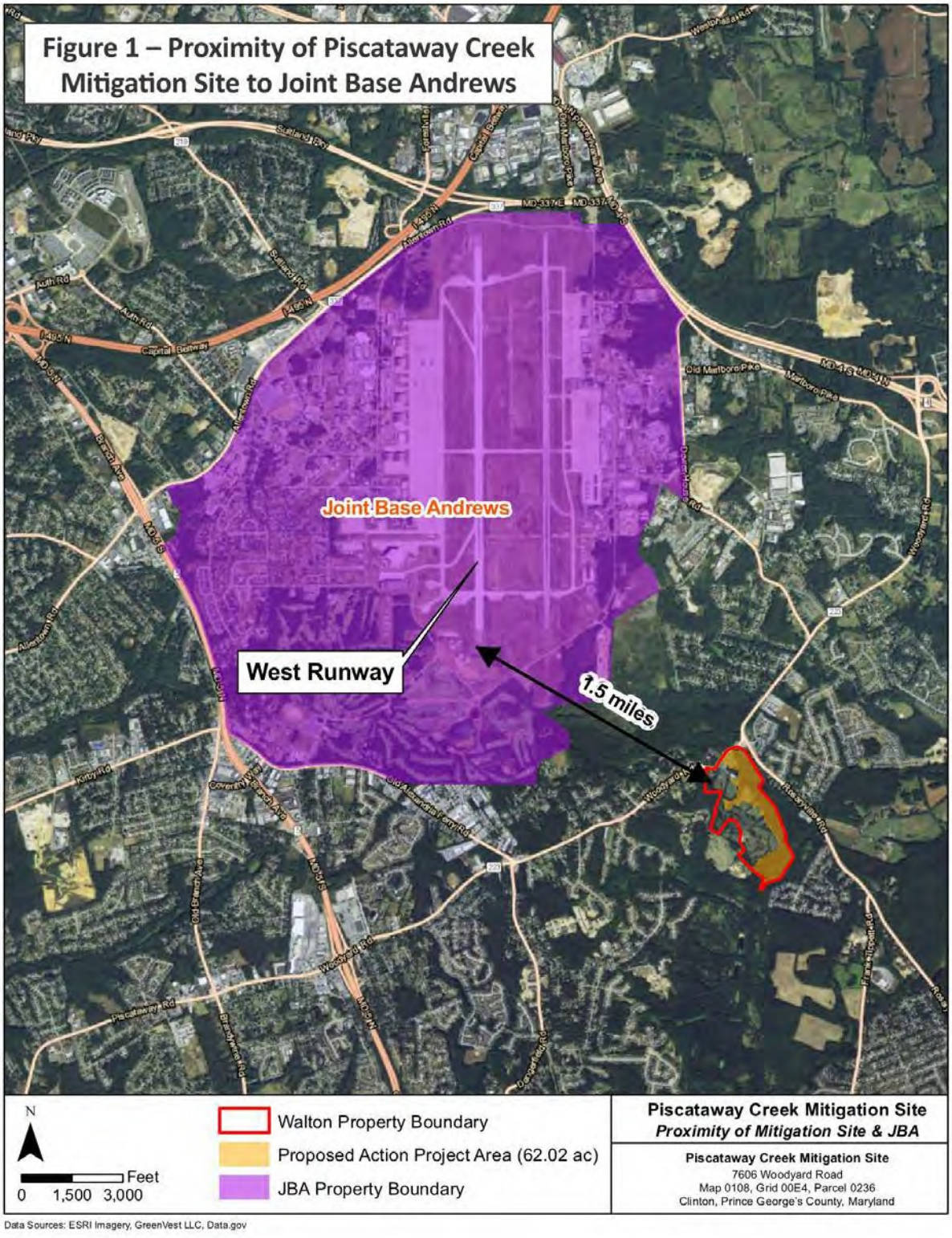

Figure 45. Location of the Piscataway Creek Mitigation Site. Figure from JBA (2016c).

2.4.4 Potential Future Impacts

Any new activities or infrastructure development plans are evaluated to determine if any limitations or restrictions apply. A 2011 Environmental Assessment (EA) assessed the impacts of projects (construction, demolition, renovation, and maintenance activities) recommended by the 2010 General Plan Update and intended to support JBA's current and future missions. A Finding of No Significant Impact (FONSI) was issued. The EA noted that whenever possible, new construction would avoid wetlands and areas where threatened and endangered species are known to occur. The 2016 IDP calls for avoiding wetlands and floodplains when siting future development at JBA. Development in wetlands should only be considered if no other alternative is available and the mission requirement is critical (JBA, 2016a).

Due to anticipated future development at JBA Main Base, JBA recently developed an IDP that identified nine planning districts for future land use planning at the Main Base (JBA, 2016a):

1. Airfield
2. West Operations
3. East Operations
4. Industrial
5. Training
6. Historic Residential (i.e., Belle Chance)
7. Administrative and Support
8. Residential
9. Recreation

Permitted uses within each planning district are described in the IDP. Specific future projects for the short-range (1 to 5 years), medium-range (6 to 10 years) and long-range (11+ years) are listed in the IDP, including in which planning district each project is located. Much of JBA's fish and wildlife resources are located in the Recreation Planning District, which includes the golf courses and Base Lake. Short-range planning projects for this district include construction of the PAR Complex, relocation of several holes at the golf courses as required for construction of the PAR Complex, and the construction of a fire station addition for the PAR Complex. No medium- or long-range planning projects have been identified for the Recreation Planning District (JBA, 2016a).

Table 11 lists the potential future land uses at JBA Main Base, as identified in the IDP of 2016. Land uses at the Main Base are anticipated to change significantly in the future (Figure 46). Generally, the future land use pattern resembles the Base's existing land use pattern with modifications to enhance functional efficiency through consolidation of similar land uses to meet the goals identified by stakeholders. A summary of the major future land use plan improvements includes:

- Airfield operations and maintenance on the east side of the airfield is expanded with the relocation of the East Runway.
- The existing industrial area on the west side of the Base, bounded by C, D, and First Streets, and Arnold Avenue is replaced by community land use for the construction of Capital Commons, near the existing Base Exchange.
- The airfield land use is expanded in the southeast corner of the airfield to accommodate mission expansion.
- Industrial functions on the west side of the Base replace a former housing area that will be returned to the Base. Open space buffers this area from the adjacent privatized housing area.

The replacement of several facilities and infrastructure components at or near the end of their useful life spans may also influence future land use (JBA, 2016a).

The IDP identified 249 acres as available for future development, distributed among 40 developable parcels (JBA, 2016a). Both open space and outdoor recreation areas will lose significant area under future development plans, some of it to the identified developable parcels. Construction of the PAR Complex is also anticipated to alter land use on the Main Base. The PAR Complex itself will convert 66.4 acres of land use from a mix of industrial (18.4 acres), open space (19.1 acres), and outdoor recreation (29.0 acres) use to airfield operations and maintenance use (Figure 47). Relocation of the JADOC Satellite Site as part of the PAR project will convert 0.3 acres of administrative land use and 15.9 acres of open space to industrial use. Relocation of the Hazardous Cargo Pad will also convert open space and/or outdoor recreation space to airfield land use, but the acreage will depend on final site selection (JBA, 2017c).

Table 11. Potential future land uses at JBA Main Base (from JBA, 2016a).

Land Use Category	Existing (acres)	Future (acres)	Difference (acres)
Administrative	154.4	268.6	+ 114.2
Aircraft Operations and Maintenance	366.3	779.4	+ 413.1
Airfield	1,525.4	1,513.0	- 12.4
Community	136.7	184.2	+ 47.5
Industrial	150.4	246.0	+ 95.6
Medical	47.0	71.9	+ 24.9
Open Space	818.0	145.3	- 672.7
Outdoor Recreation	768.4	698.3	- 70.1
Residential	436.1	495.8	+ 59.7
TOTAL	**4,402.6**	**4,402.6**	**0**

Future plans for JBA may potentially impact natural resources. Although each project will be evaluated for natural resources impacts as part of the EIAP, some impacts are already anticipated. The PAR project was initiated in late FY2018 and early FY2019 with the relocation of five golf course holes (W4, W5, W6, E6 and E7) to accommodate the PAR Complex (Figure 48). Altogether projects associated with PAR have the potential to remove nine golf course holes.

Impacts to wetlands are anticipated to be mitigated through the use of compensatory wetland mitigation banks. The IDP anticipates future impacts to 60 acres of wetlands in the airfield, as wetlands and airfields are incompatible land uses (JBA, 2016a). Opportunities for compensatory wetland mitigation on Base are limited and off-Base opportunities for wetland mitigation have been difficult to locate and develop.

The USACE, DoD (JBA) and State of Maryland finalized an Umbrella Mitigation Bank Instrument (UMBI) in 2017 for compensatory wetland and stream mitigation (JBA, 2017d). The UMBI governs the establishment, use, operation, maintenance and closure of the umbrella bank by establishing guidelines and responsibilities for use by JBA and where appropriate other DoD facilities within the approved service area of the UMBI (i.e., Maryland). Under the UMBI, the Mattawoman Creek Mitigation Site (MCMS) has been

created in Charles County, Maryland (Figure 49; GreenVest, 2017). The MCMS is located near Pomfret along an unnamed tributary to Mattawoman Creek. Anticipated wetland and stream impacts from the PAR project will be mitigated at the MCMS. Stream impacts are anticipated to be 3,973 linear feet (JBA, 2017c). The scale of wetland impacts will be finalized with the final design of the PAR project and coordination with regulators but are tentatively anticipated to be between 3.56 and 5.76 acres (JBA, 2017c, 2018d). The MCMS has the capacity to create 9.40 acres of wetlands, restore 12.10 acres through re-establishment, restore 24.71 acres through rehabilitation, enhance 0.51 acres, and preserve 14.32 acres. The bank may also enhance 4.45 acres of non-tidal wetland buffer and preserve 5.66 acres of non-tidal wetland buffer. Up to 3,798 linear feet of stream restoration and 4.04 acres of stream buffer are included at MCMS. A total of 42.347 acres of wetland mitigation credits and 3,798 linear feet of stream credits are available at MCMS (GreenVest, 2017). The MCMS "will add approximately 81 acres of restored, created, enhanaced and preserved forested, freshwater wetland in a recognized (MDE, USACE and USEOA) priority restoration and Tier II watershed (GreenVest, 2017, p.2). JBA intends to use the MCMS for future potential wetland and stream impacts, as well as any remaining credits available at PCMS.

In addition to the wetland and stream impacts anticipated from the PAR project, construction of the project is anticipated to impact 41.47 acres of forest, 3.33 acres of the 100-year floodplain and 18.55 acres of the 500-year floodplain; the area of impervious surfaces on the Main Base is anticipated to increase by 43.52 acres (JBA, 2017c). Mitigation of the forest impacts will occur through reforestation of 60% of the impacts, or 24.88 acres. Relocation of the JADOC Satellite Site and HCP are also anticipated to impact forests, wetlands, streams, floodplains and impervious surfaces. Several HCP site alternatives are being evaluated, with final site selection anticipated in FY2019. The total impacts from PAR-associated projects have the potential to eliminate nine golf course holes, primarily due to proximity to the HCP and safety regulations (JBA, 2017c).

The conceptual construction phasing schedule for the PAR project starts with relocation of the JADOC Satellite Site in 2018. Relocation of the golf course holes was initiated in the fall of 2018 and will continue into early 2019. The PAR Complex anticipates construction starting in early 2019 and extending into 2021. Relocation of the HCP is planned for 2019-2020. If necessary, relocation of the Military Working Dog Kennel would occur in late 2020 – early 2021 (JBA, 2017c).

As there are no critical habitat designations at JBA or in its vicinity, potential future development at JBA is not anticipated to impact critical habitat. The pursuit of off-Base compensatory wetland and stream mitigation is intended to improve and protect wetland and stream resources near the installation, as well as downstream in Chesapeake Bay.

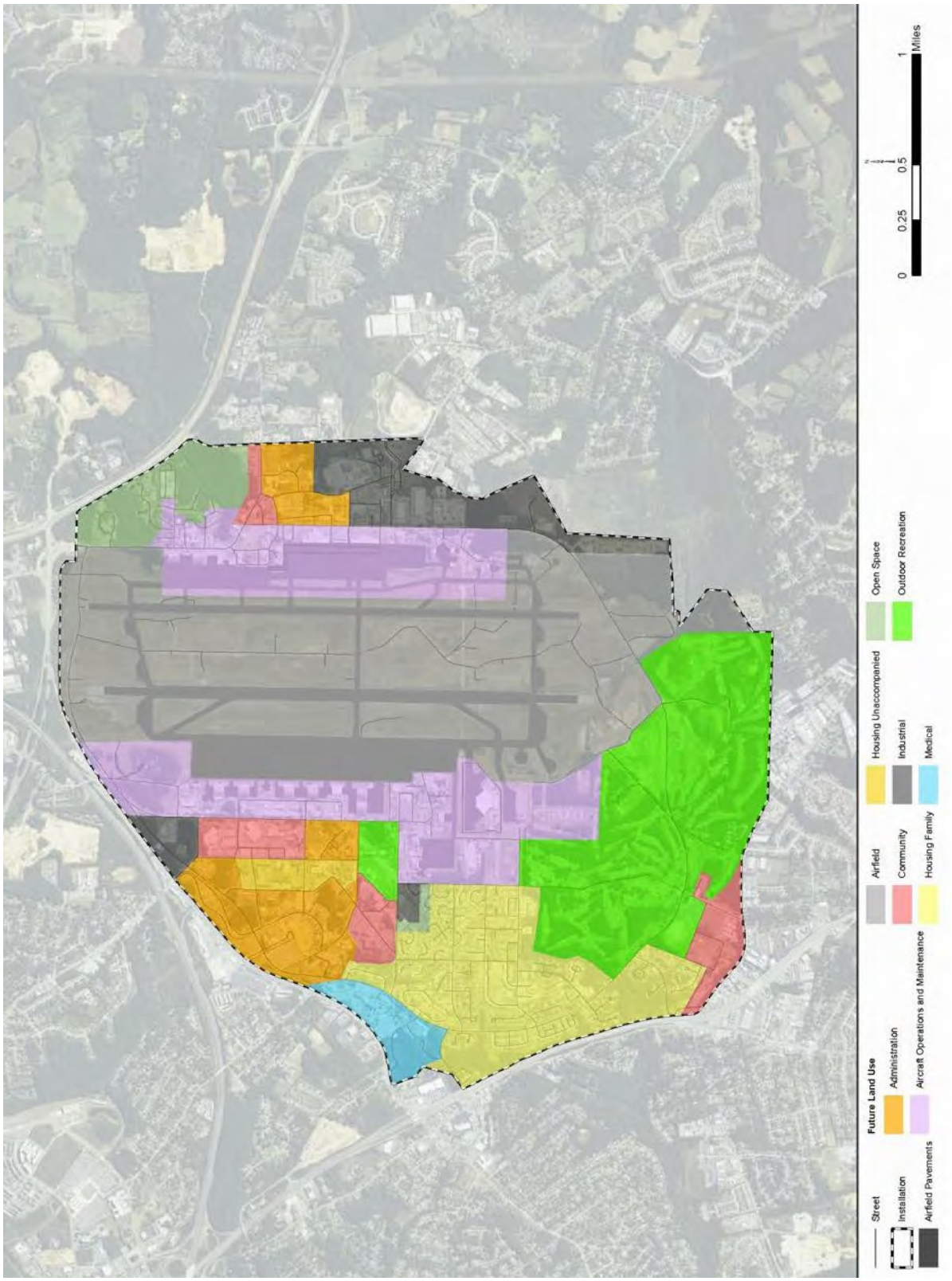

Figure 46. Future land uses at JBA Main Base anticipated in the IDP (JBA, 2016a).

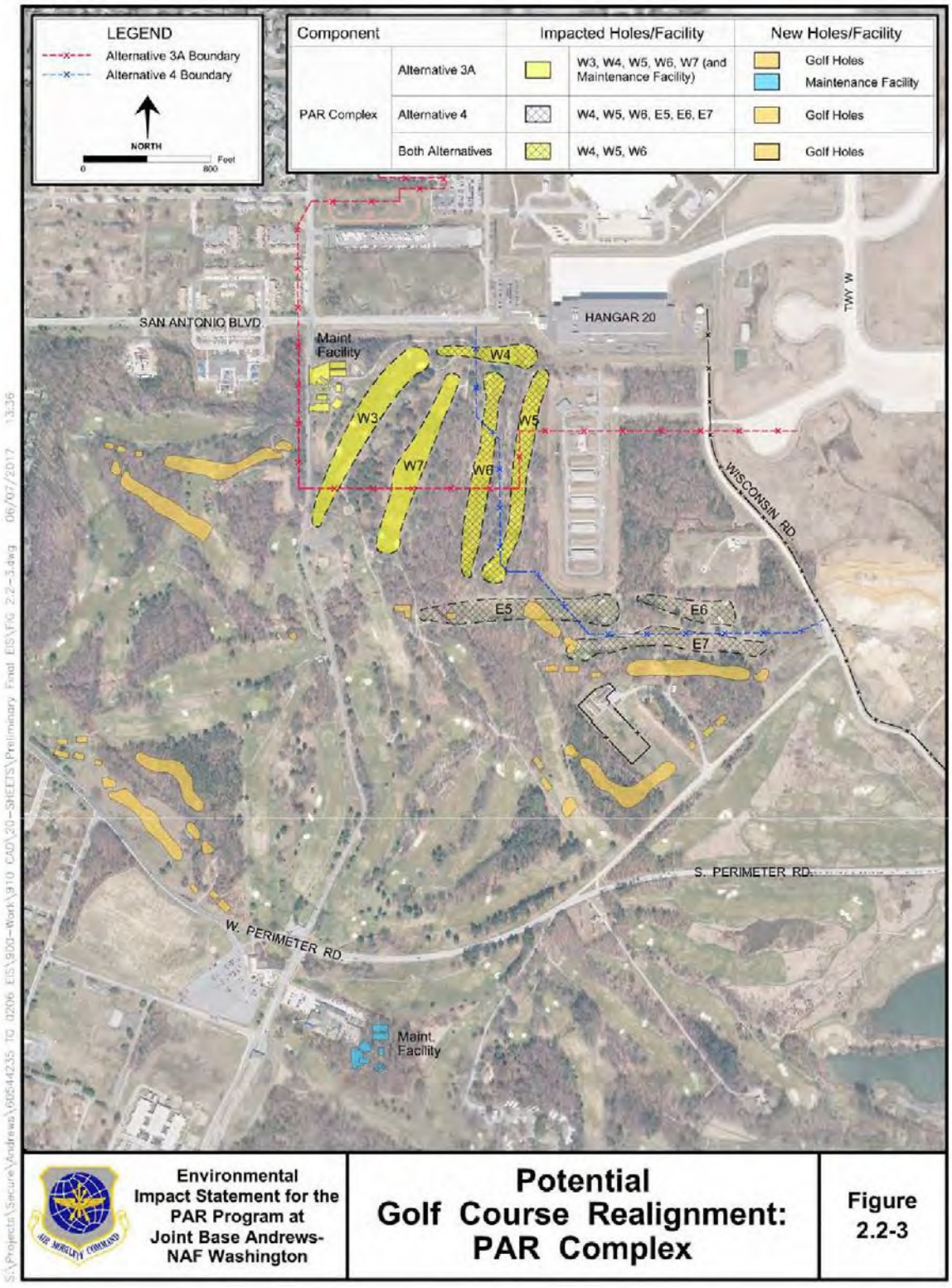

Figure 47. Anticipated construction of the PAR Complex will alter land use on the Main Base. Figure from JBA (2017c).

Figure 48. The West, East and South Golf Courses at The Courses at Andrews.

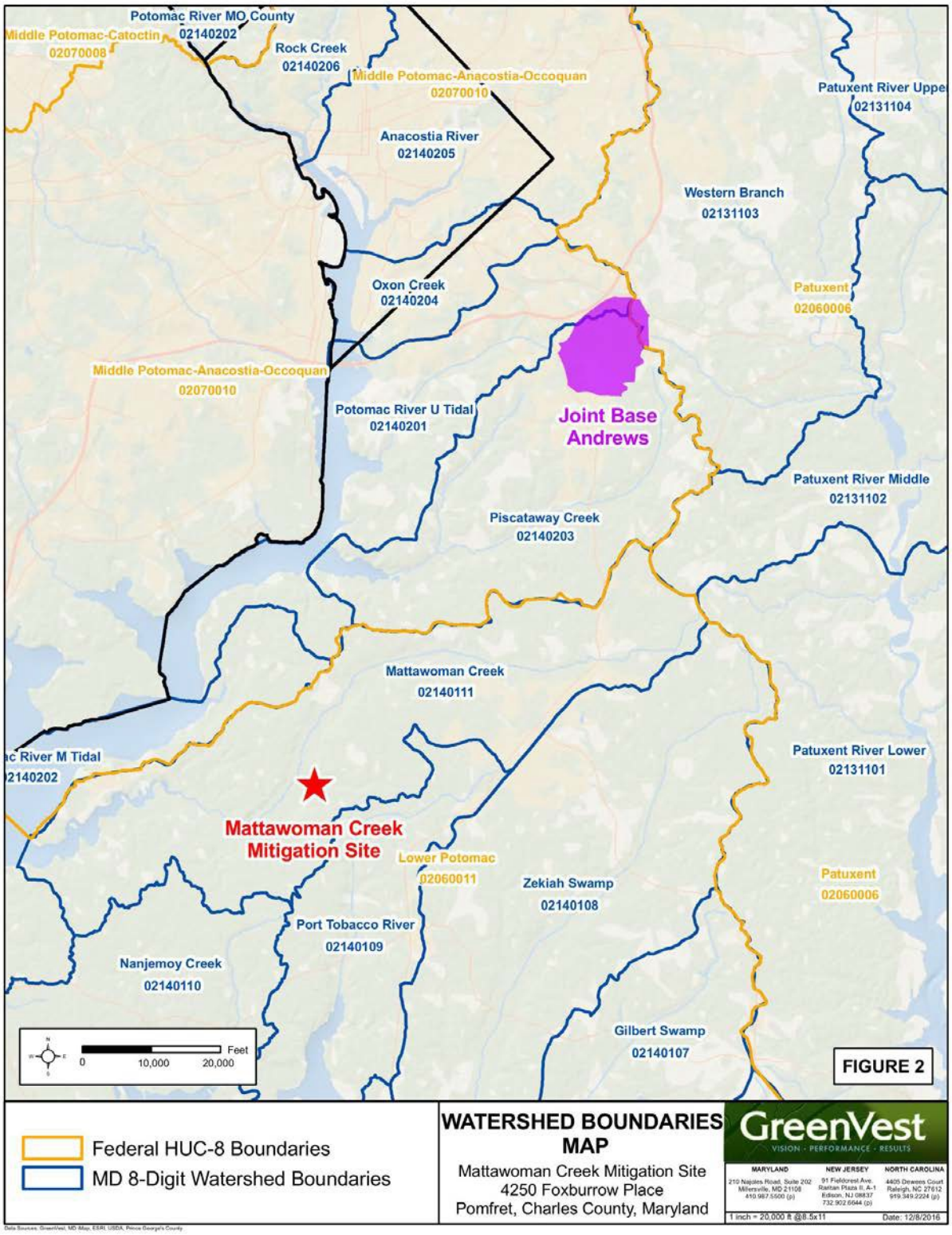

Figure 49. Location of the Mattawoman Creek Mitigation Site. Figure from GreenVest (2017).

2.4.5 Natural Resources Needed to Support the Military Mission

The military mission of JBA requires several natural resources at the installation. The airfield requires open, level ground that is well-drained and free of BASH. Vegetation in the imaginary surfaces areas must be free of vegetation obstructions for safe flight operations.

Clear lines of sight are also needed for flight operations and communications at JBA. An approximately 20% loss of usable radials in the eastern half of the very high frequency omnidirectional range (VOR) station spectrum (the western half of radials are procedurally unusable due to the airspace limitations) for JBA's approach/departure airspace has been documented due to incompatible adjacent land uses. The Davidsonville Transmitter Site, Brandywine Receiver Station, and main JBA Base require line-of-sight triangulation to ensure sustained microwave communications. However, Prince George's County does not have regulations for preventing obstructions (e.g., buildings, towers) that could disrupt radar and communications. The height of structures under the corridor must be restricted so that they do not penetrate the transmission line-of-sight. Residential zoning categories for Prince George's County include height restrictions; however, commercial and industrial zones do not. Proposed development projects near the Brandywine and Davidsonville GSUs may have direct mission impacts for JBA by encroaching on the line-of-sight even further (JBA, 2016a). A planned project to replace the communication links with fiber optics may ameliorate this issue.

Open fields are needed at both the Brandywine and Davidsonville GSUs to allow for helicopter landing zone training. The Courses at Andrews are a significant contributor to the morale, welfare and recreation (MWR) facilities for Base personnel, generating revenues used for MWR activities elsewhere at JBA, including Child Development Programs and other programs like Outdoor Recreation, youth programs, etc. (JBA, 2016a). The golf courses area natural resource-based recreational activity and are preferred in the National Capital Region for senior United States leadership.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The AF environmental program adheres to the Environmental Management System (EMS) framework and it's Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, U.S. Department of Defense Instruction (DoDI) 4715.17, *Environmental Management Systems*, AFI 32-7001, *Environmental Management*, and international standard, ISO 14001:2004, 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 managing associated risks, and instilling a culture of continuous 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	INRMP Signature Authority Chairman, Facility Board
AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS)	Assistance with INRMP Implementation, Updates and/or Revisions
Installation Natural Resources Manager/POC	Coordination of INRMP Implementation and Annual Reviews
Installation Security Forces	Installation Security Hunting / Fishing Law Enforcement
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	Manage and monitor EMS requirements and compliance assessments
Installation Wildland Fire Program Manager	Not applicable
Pest Manager	Implementation of IPMP
Range Operating Agency	Not applicable
Conservation Law Enforcement Officer (CLEO)	Not applicable
NEPA/Environmental Impact Analysis Process (EIAP) Manager	EIAP consistency with INRMP
National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS)	Not applicable
US Forest Service	Not applicable
US Fish and Wildlife Service	INRMP Signature Authority The USFWS and MD DNR provide technical assistance to JBA and are partners in the development and review of this INRMP. Specifically, these agencies will alert the 11 CES/CEIE personnel whenever new species that have the potential for inhabiting JBA are added to the federal or state endangered species lists. In addition, these agencies support 11 CES/CEIE personnel during scheduled wildlife and vegetation surveys. The USFWS and MD DNR also support specific management recommendations and projects to support implementation of this INRMP.
USDA APHIS-WS	BASH Contractor Wildlife Management / Depredation
Maryland Department of Natural Resources	INRMP Signature Authority The USFWS and MD DNR provide technical assistance to JBA and are partners in the development and review of this INRMP. Specifically, these agencies will alert the 11 CES/CEIE personnel whenever new species that have the potential for inhabiting JBA are added to the federal or state endangered species lists. In addition, these agencies support 11 CES/CEIE

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	personnel during scheduled wildlife and vegetation surveys. The USFWS and MD DNR also support specific management recommendations and projects to support implementation of this INRMP.
316th Wing, Vice-Wing Commander	Chairman, Environmental Safety and Occupational Health Committee
316th Wing, Judge Advocate	Regulatory Interpretation Off-Base Dispute / Complaint Resolution Legal Representation
316th Wing, Mission Support Group, Civil Engineering, Engineering, Programming and Design	Base IDP Project Programming, Management and Design Landscaping Specifications for New Construction
316th Wing, Mission Support Group, Civil Engineering, Operations	Oil / Water Separator Maintenance General Grounds Maintenance Pest Management Wildlife Management / Deer Depredation Airfield Grounds Maintenance (Mowing) Clear Zone Tree Removal BASH Monitoring and Minimization
316th Wing, Mission Support Group, Civil Engineering, Installation Management	Environmental Impact Assessment Process Stormwater / Erosion Control Forest Management Wildlife Management Oversight Hazardous Materials Management Environmental Restoration Program Air Quality Monitoring / Compliance Water Quality Compliance Wetlands Management Pollution Prevention Grounds Maintenance in Dormitory Areas
316th Wing, Mission Support Group, Force Support, Community Services	Golf Course Grounds Maintenance Nature Education / Outdoor Recreation Activities Family Camp Outdoor Recreation Equipment Rental / Check Out Yuma Nature Trail Maintenance
89th Airlift Wing, Flight Safety	BASH Management, Monitoring and Minimization (On and Off Base)
316th Medical Group, Bioenvironmental Engineer	Safe Drinking Water Quality Monitoring
316th Medical Group, Military Public Health	Zoonosis Monitoring Mosquito and Tick Surveillance

5.0 TRAINING

AF installation NRMs/POCs and other natural resources support personnel require specific education, training and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required

within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement – Training

Natural resources management training is provided to ensure that Base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan.

JBA does not have formal training requirements for natural resources management personnel at this time. Opportunities exist to improve the training of personnel responsible for natural resources management on Base. In accordance with AFI 32-7064, Natural Resource Managers (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 School, Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force NRMs Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov).

Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses.

All individuals who will be enforcing fish, wildlife and natural resources laws on AF 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 (http://www.fletc.gov/).

Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.

Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.

The DoD supported publication *Conserving Biodiversity on Military Lands – A Handbook for Natural Resource Managers* (http://dodbiodiversity.org) provides guidance, case studies and other information regarding the management of natural resources on DoD installations.

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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.

Installation Supplement – Recordkeeping

JBA currently maintains a mix of paper and electronic records of natural resources data, surveys, reports, and materials organized through AFRIMS. There is a need to digitize and organize the paper records, which would identify data gaps in preparing, implementing and monitoring the INRMP for JBA.

6.2 Reporting

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

Installation Supplement –Reporting

The Natural Resources Manager (NRM) is responsible for preparing the Annual Reviews for the INRMP. Other managers and personnel are responsible for preparing reviews and reports for INRMP-associated plans. For records and reporting requirements related to pest management, see Section F(6) of the IPMP (JBA, 2018a). The BASH Plan describes reporting procedures related to bird / wildlife strikes, wildlife management and depredation (JBA, 2014a). The Stormwater Management Plan describes the recordkeeping and reporting requirements for stormwater management at JBA (JBA, 2017a).

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

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

Installation Supplement –Natural Resources Program Management

The guiding philosophy of this INRMP is to take an adaptive, ecosystems approach to managing the natural resources present on JBA. Ecosystem management provides a framework to link the military mission to local, regional, and global ecological integrity. Sustaining ecosystem integrity is the best way to protect and enhance biodiversity, ensure sustainable use, and minimize the effort and cost of management.

Ecosystem management is based on clearly stated goals and objectives, and associated activities and projects. Activities are generally in-house, no cost actions undertaken by Base personnel. Projects are generally performed by others, usually under contract JBA. In addition, projects can be performed using non-DoD funds or by volunteers.

This section summarizes each technical area of natural resources management and identifies applicable goals and objectives.

7.1 Fish and Wildlife Management

Applicability Statement

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

Program Overview/Current Management Practices

Natural resources at JBA will be managed with an ecosystem management approach as directed by AFI 32-7064 and DoDI 4715.03. Ecosystem management may be defined as management to restore and maintain the health, sustainability, and biological diversity of ecosystems while supporting sustainable economies and communities. The goal of ecosystem management on military lands is to ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. As described in DoDI 4715.03, ecosystem management incorporates the following elements:

- Avoid single-species management and implement an ecosystem-based multiple species management approach, insofar as that is consistent with the requirements of the ESA.
- Evaluate and engage in the formation of local or regional partnerships that benefit the goals and objectives of the INRMP.
- Use the best available scientific information in decision-making and adaptive management techniques in natural resource management.
- Foster long-term sustainability of ecosystem services.
- Use an adaptive management approach to manage natural resources such as climate change.

The last bullet can be further described as managing natural resources in a changing environment shaped by multiple stressors such as climate change, habitat loss and fragmentation and human development pressures.

Ecosystem management includes biodiversity conservation. Biodiversity is the degree of variation of life forms within a given ecosystem. The INRMP is identified by DoD as the primary vehicle for conserving biodiversity on military installations. USAF principles for ecosystem management, as described in AFI 32-7064, include biodiversity conservation. Biodiversity conservation can be achieved by maintaining or reestablishing viability populations of all native species on installations when practical and consistent with the military mission.

Other USAF ecosystem management principles include the following:

- Maintain or restore native ecosystem types across their natural range where practical and consistent with the military mission.
- Maintain or restore ecological processes such as wild land fire and other disturbance regimes where practical and consistent with the military mission.
- Maintain or restore the hydrological processes in streams, floodplains, and wetlands when feasible.
- Use regional approaches to implement ecosystem management on an installation by collaboration with other DoD components as well as other federal, state and local agencies, and adjoining property owners.
- Provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such uses do not inflict long-term ecosystem damage or negatively impact the USAF mission.

Related USAF guidance also cites the need for invasive species control as well as the conservation of rare, threatened and endangered species and communities when practical and consistent with the military mission.

The Fish and Wildlife Management Program at JBA addresses issues related to the management of game and non-game species and their habitats, as well as biodiversity. Management of fish and wildlife resources is not only a natural resource stewardship responsibility but is also an important quality of life program. The primary issues addressed under this program include biodiversity, wildlife habitat management, recreational hunting and fishing, compliance with environmental regulations, protection of migratory birds and nuisance wildlife and disease control.

7.1.1 Hunting and Fishing Program

The variety of habitats present at the Main Base and GSUs contributes to the diversity of wildlife species. Documented non-game species include raptors, gulls, killdeer (*Charadrius vociferous*), moderate flocks of migrating starlings and cowbirds (*Molothrus ater*), waterfowl, wading birds, and songbirds. Game species that have been documented include white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), red fox (*Vulpes vulpes*), gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), Canada geese (*Branta canadensis*), mallard (*Anas platyrhynchos*), lesser scaup (*Aythya affinis*), mourning dove (*Zenaida macroura*), and northern bobwhite quail (*Colinus virginianus*).

Populations of these species are limited by the reduction and fragmentation of suitable habitat outside of JBA and isolation of habitats at JBA. In addition, JBA does not encourage their population growth on the Main Base because of their incompatibility with aircraft operations. However, the GSUs offer the opportunity to manage for wildlife populations. An expansive and relatively contiguous area of open grasslands at both remote sites provides nesting and foraging habitats for many wildlife species.

The Brandywine Bowhunting Club, administered by retired military personnel, is open to all active duty military and their dependents, veterans, and civilian DoD employees of JBA. The Club is officially chartered through the 316th MSG/Force Support Squadron. The recreational hunting program began bowhunting deer at Brandywine GSU in 2008 and through the 2013-14 season had approximately 28-30 members. In the spring of 2015 the Club began hunting turkey at the Brandywine GSU and extended their membership to 60 on a first-come, first-serve basis. The Club initiated bowhunting deer at the Davidsonville GSU in the 2014-15 season and would like to expand the recreational hunting at Davidsonville GSU to include turkey. Table 13 lists the hunting counts at both GSUs from the 2013-14 through the 2017-18 winter and spring hunting seasons. Since 2009 the Brandywine Bowhunters Club averages 18 or 19 doe and nine bucks every hunting season at the Brandywine GSU and 24 to 25 doe and six to seven bucks at Davidsonville GSU. An average of one turkey is taken annually at the Brandywine GSU. Club members annually perform volunteer work details at the GSUs to maintain trails and parking areas for recreational hunting.

Recreational fishing is allowed at the Base Lake without a permit. Due to water quality concerns fishing is limited to catch and release. A large section of the lake's perimeter is surrounded by the golf course, further limiting the opportunity for recreational fishing. There are no piers on the lake, and due to safety concerns JBA has no future plans to construct fishing piers. The lake may also be used for non-motorized boating. Due to mission and security constraints, no public access is permitted for hunting, fishing, trapping, or other wildlife-related outdoor recreation at the Main Base or GSUs.

Table 13. Bowhunting counts at the Brandywine and Davidsonville GSUs, 2013 – 2017.

Species	Hunting Season				
	2013-14	2014-15	2015-16	2016-17	2017-18
Brandywine GSU					
Deer, Doe	16	15	13	9	24
Deer, Buck	7	10	10	9	5
Turkey	n/a	1	4	2	0
Davidsonville GSU					
Deer, Doe	n/a	26	30	24	19
Deer, Buck	n/a	5	6	9	6

7.1.2 Conservation Law Enforcement

JBA has multiple natural resources consultation requirements in addition to the INRMP development and review requirements as identified in the SAIA. Federally listed threatened and endangered species management requires ESA Section 7 consultation with the USFWS. State listed threatened and endangered species management and game species management requires consultation with MD DNR. Actions that fall under the jurisdiction of Section 404 or 401 of the CWA necessitate permitting from the USACE and MDE, respectively.

JBA would also be required to coordinate with the National Marine Fisheries Service regarding Essential Fish Habitat in any cases where a proposed action could have an impact on fisheries protected under the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265). Because this coordination is meant to protect essential breeding and critical life stage habitats for commercially important fish, no consultation would be required for the Main Base or Brandywine Receiver Station. The Davidsonville Transmitter Station, however, is bounded on the west by a protected portion of the Patuxent River, which may support critical stages of some protected fish species.

Intra- and inter-agency cooperation, coordination, and communication at the federal, state and local levels (e.g., USFWS and MD DNR) are requisite to the success of the INRMP. The USFWS and MD DNR review the INRMP and its implementation and can contribute specialized expertise to assist with natural resources management at JBA.

MOU, MOA, and other cooperative agreements with other federal agencies and various state agencies allow installations and agencies to obtain mutual conservation objectives.

7.1.3 Migratory Birds

Mature forests are important to nesting and foraging song birds where their long-term survival is dependent on a diversity of natural habitats. To minimize temporal and long-term impacts to migratory avian species, JBA will conduct the following actions:

1) Land clearing to be scheduled outside the migratory bird nesting period (March through August), to avoid adversely impacting active nests containing eggs or young as prohibited under the MBTA. Some

species of raptors begin nesting in February, such as Great-horned owls and bald eagles, which are common to the area.

2) Where possible, maintain existing forested corridors to allow for connectivity between forest patches or stands.

3) Implement reforestation initiatives where possible, to create or enhance natural habitats for bird diversity.

In summary, one of the most important steps that JBA personnel will be taking is to avoid the incidental take of migratory birds and to initiate tree clearing after the annual nesting season. Ideally, tree removal should occur in the fall or winter seasons. JBA will continue to work in partnership with the USFWS (Chesapeake Bay Field Office @ 410-573-4534) in the continued protection of natural resources.

7.1.4 Nuisance Wildlife and Wildlife Disease

In addition to wildlife described in the BASH Plan that pose threats to aircraft, other species that sometimes cause nuisance at JBA include rodents (field mice [*Mus musculus*], Norway and roof rats [*Rattus norvegicus* and *Rattus rattus*], and squirrels), raccoons (*Porcyon lotor*), opossum, groundhogs (*Marmota monax*), feral cats, stray dogs, foxes, bats, beavers, pigeons, crows, starlings, and sparrows (JBA, 2014a). Most nuisance wildlife is currently managed according to the Integrated Pest Management Plan (JBA, 2018a). Refer to Section 7.11 for additional information on the IPMP.

Rodents can carry disease, and animals such as foxes may be infected with rabies. Bird droppings from roosting in aircraft hangars can contribute to disease as well as corrosion of aircraft. Beavers destroy trees and vegetation, erode soil, and block waterways that cause flooding. Flooded areas in turn can breed disease-vector pests. Beavers can be found at both the Main Base and the GSUs due to the presence of flowing streams and undisturbed forestation (JBA, 2014a). Maryland state law prohibits the relocation of beavers, which requires JBA to coordinate with MD DNR, USFWS and the National Park Service on non-lethal means of reducing the beaver population.

Table 14 lists the lethal control counts for mammals at the JBA Main Base from 2013 to 2017, which are authorized under an annual Wildlife Damage Control Permit from MD DNR. Annual reports on lethal

Table 14. Lethal control of mammalian nuisance species at JBA Main Base, 2013 – 2017.

Mammal Species	Calendar Year				
	2013	2014	2015	2016	2017
Beaver	6	7	6	0	11
Deer	26	12	42	57	9
Fox	2	3	3	0	8
Groundhog	6	21	7	2	15
Opossum	4	0	0	1	0
Otter	0	0	0	0	1
Raccoon	7	5	5	1	5
Skunk	1	3	0	0	1

controls of nuisance wildlife taken under the annual permit are submitted to MD DNR. The animals currently are disposed of in a landfill but JBA personnel have identified a need to evaluate other disposal methods such as contracting services for carcass removal or donation of deer to an approved meat processor or food donation program. Identifying alternative disposal methods may allow for increased depredation of nuisance deer on the Main Base.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

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

Program Overview/Current Management Practices

AFI 34-110, *Air Force Outdoor Recreation Programs*, dated 29 August 2018, provides guidance on outdoor recreation activities and programs at AF installations. Outdoor recreation program activities are to be incorporated into an installation's INRMP IAW AFI 34-110. The installation's outdoor recreation program should include organized activities and outdoor adventure opportunities as well as equipment for loan or rental. The three core outdoor facilities and recreation areas that should be provided on-Base are an outdoor recreation and equipment center, an aquatics facility and swimming pool, and parks with playgrounds and picnic areas. The outdoor recreation core activities include camping, canoeing, kayaking, bicycling, fishing, hunting, walking, hiking, snow skiing and boarding, picnicking, unit outings, swimming, and nature and wildlife appreciation. Support for these activities is to be provided at every installation where it is geographically appropriate. If a suitable setting for the activity is available nearby or within a couple hours drive, then the activity should be supported. When the installation cannot provide certain outdoor recreation activities on-Base, a referral system should provide information on off-Base recreational opportunities.

Outdoor recreation activities at JBA include camping, hiking, picnicking, hunting, fishing, boating, and archery. Other outdoor recreation facilities include three 18-hole golf courses and the Base Lake (Freedom Lake), located on the south golf course. Recreational fishing at JBA is limited to Freedom Lake.

The 11 WG's Outdoor Recreation office is responsible for nature education, outdoor recreation activities, family campgrounds (FAMCAMP), outdoor recreation equipment rental and the maintenance of the Yuma nature trail, located in Yuma Park adjacent to Liberty Park neighborhood. Due to mission and security constraints, no public access is permitted for outdoor recreation at JBA Main Base, the Davidsonville GSU, or the Brandywine GSU, with two exceptions. Civilian guests sponsored by authorized personnel at the Courses at Andrews may enter and park near the Virginia Avenue Gate adjacent to the clubhouse. The South Maryland Little League uses Bottner Field for public baseball games at the Davidsonville GSU.

The quality of life of those who live and work at JBA is enhanced by the amenities provided by the installation and the surrounding communities. Helping to attain and maintain an acceptable installation is one goal of the IDP (JBA, 2016a). Elements such as architectural compatibility guidelines contribute to maintaining Air Force quality of life (QOL) program standards. The generally accepted factors that influence the QOL on or off a military installation are:

- Education
- MWR facilities (fitness centers, community centers, bowling center, arts and crafts, etc.)
- Community Support (base exchange, commissary, child daycare centers)
- Outdoor Recreation (parks, pools, ball fields, and preserved open space)

The golf courses at JBA are preferred in the NCR for senior United States leadership. The average distinguished visitor weekend schedule contains about 28 government officer tee times (112 players). The golf course has $3.4 million annual revenue. The success of the golf course also provides MWR facilities contributions for Child Development Programs and other programs like Outdoor Recreation, youth programs, etc. (JBA, 2016a).

JBA has one youth center in Building B4700. Approximately 150 to 200 children participate in summer camp activities at the youth center. The youth center also provides before and after school daycare programs among other activities and programs. There are two fitness centers and two child daycare centers on the Main Base (JBA, 2016a).

In addition to the Bottner Field Little League baseball field at the Davidsonville GSU, outdoor recreation facilities on the Main Base that contribute to the core activities described in AFI 34-110 include the following:

- Three 18-hole golf courses
- Yuma Park
- Freedom Park
- Base Lake
- 11 playgrounds
- 2 swimming pools
- 8 tennis courts
- 8 basketball courts
- 2 tracks
- 1 fitness path
- 1 perimeter trail (used by joggers as well as SFS patrols)
- 1 set of athletic fields
- 7 baseball and softball fields (7.6 acres)

Bicycle paths are limited at the Main Base. The IDP identified opportunities to improve bicycle and pedestrian facilities at the Main Base (JBA, 2016a). Under the privatized housing lease, Clark Realty Capital is responsible for maintaining outdoor recreational facilities within the housing area, Liberty Park. Liberty Park also contains a community garden.

Outdoor recreation facilities at JBA are within Planning District 9, the Recreation District, which is located at the south end of the Main Base (Figure 50). The Recreation District also maintains the open space and buffers associated with the runways in the Airfield District. In 2016 the IDP found that overall the MWR resources at JBA are located in facilities with degraded conditions, with some portions of facilities closed (JBA, 2016a).

Although the IDP identified zero developable parcels within the Recreation District, future planned projects for JBA have the potential to impact outdoor recreation facilities on the Main Base, as briefly discussed in Section 2.4.4. Most of the potential impacts to outdoor recreation facilities and opportunities at JBA are related to the PAR project. As part of the relocation projects associated with the PAR complex, the AJXF163016 - Golf Course Hole Project will relocate or replace up to a half-dozen golf course holes and the associated layout of the golf course that will be displaced by the PAR complex. The FEIS for the PAR project determined that desired services and amenities associated with the recreational value of the golf course could have negative effects on the quality of life of the installation if the improvements were not

implemented (JBA, 2017c). As a result, five holes at the golf courses were reconfigured in 2018 to accommodate the PAR Complex.

Other facilities at JBA that will be relocated as part of the PAR project include the JADOC Satellite Site and the HCP. The JADOC Satellite Site relocation will not impact outdoor recreation at JBA, but site alternatives under evaluation for the HCP relocation could impact outdoor recreation facilities and opportunities. Depending on the final site selection and design, nine or possibly 18 golf holes could be eliminated. The estimated overall financial impact is projected to be a decrease of up to $1.2 million of the approximate $3.4 million total annual revenue generated by the golf courses. The decrease will be reflected in a reduction in golf tournaments, annual membership fees, catered events and golf cart revenue. Of note, revenue generated from the Golf Course supports MWR programs at JBA designed to provide outreach and assistance to airmen and their families (JBA, 2017c).

For MWR going from a potential net of $124,000 to a potential loss of approximately $60,000 would impact Airmen (e.g., non-appropriated fund (NAF) activities that are unable to sustain, recapitalize, and provide Airmen programs, reduced hours and services impacting hundreds of customers daily). This could translate to Airmen and families having to pay increased fees and charges, having fewer program offerings, or having to go off Base for services previously provided on Base. In addition, it could impact funding for Airmen and family morale events (annual base-wide picnics, community days and unit support/bonding events) currently supported with $150,000 in NAF funds over the last five years (JBA, 2017c).

The success of JBA golf course also provides contributions for Child Development Programs, which are not currently (consistently) financially solvent, and other programs like Outdoor Recreation, youth programs, etc., which would be potentially impacted by some of the HCP site alternatives under consideration (JBA, 2017c).

Access to the Brandywine and Davidsonville GSUs currently is limited to the Brandywine Bowhunters Club (Figures 51, 52) and the South Mountain Little League. Unauthorized trespass has been observed at the Davidsonville GSU by off-road vehicles. A metes and bounds survey of the boundaries of both GSUs is needed. AF property boundaries need to be clearly marked using a method resistant to vandalism. A management plan for public access and use, including by off-road vehicles, should be developed for the GSUs.

The *USAF Pollinator Conservation Guide* recommends adding outdoor recreation and natural-resource based activities at pollinator conservation areas on AF installations (USFWS, 2017). The guide also describes education and outreach activities that may provide opportunities for JBA and would be consistent with AFI 34-110.

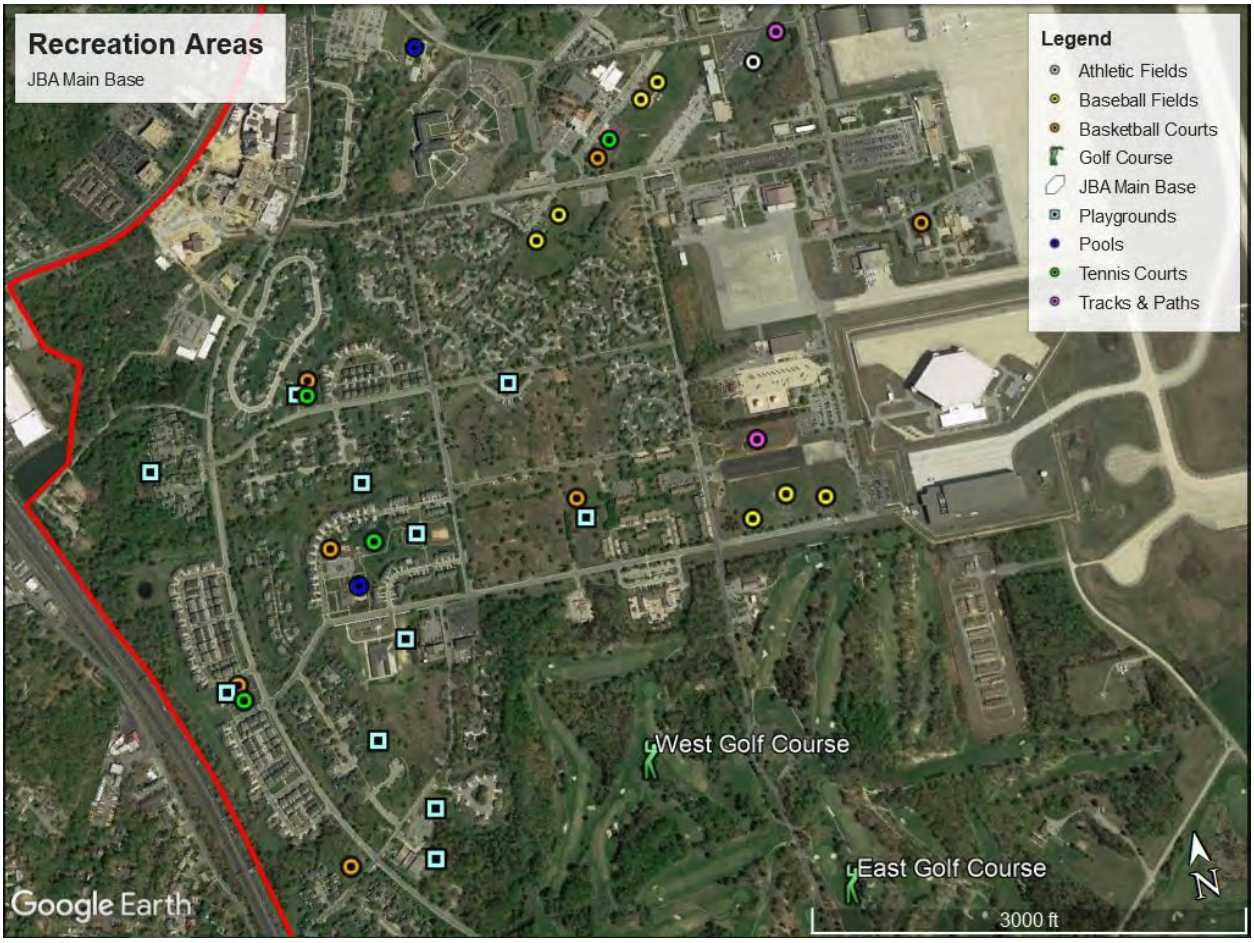

Figure 50. Most of the recreation areas and facilities at JBA Main Base are located on the south and west areas of the Base or within the Liberty Park residential area. A second track is located on the northeast side of the Base off Fetchet Avenue. The FAMCAMP campground is located on the south side of the Base between Holes E15 and E17 of the East Golf Course (see Figure 48).

7.3 Conservation Law Enforcement

Applicability Statement

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

Program Overview/Current Management Practices

Currently, JBA does not have a natural resources law enforcement program, because there is no pressing need for one. JBA Main Base and the GSUs are secure sites with no authorized general public access, with the exception of public access to a Little League baseball field at the Davidsonville GSU. Providing force protection for DoD personnel and assets at JBA is the mission of the 11th Security Forces Squadron (11 SFS). 11 SFS operates under the general guidelines prescribed in AFPD 31-2 *Law Enforcement* and the implementing and interfacing policies referenced within it.

JBA's natural resources, although restricted in diversity and abundance by AF mission, are still in need of enforcement and protection. The installation does not retain full-time park rangers or conservation law enforcement officers. Although 11 SFS personnel do not primarily function as conservation law enforcement officers, should a situation arise where enforcement was needed to stop an incipient or occurring illegal action, 11 SFS would assist in coordination with Base Civil Engineer Squadron Commander (11 CES/CC) and, if required, the Mission Support Group Commander (11 MSG/CC). In accordance with AFI 32-7064 para. 6.4.2, the commander may designate fish and wildlife law enforcement authority to military or civilian personnel only if the person has either been certified in conservation law enforcement through training at the Federal Law Enforcement Training Center or by commission as a fish and wildlife conservation officer in the state where the installation is located. Law enforcement personnel who do not possess either federal or state fish and wildlife enforcement certification can be used to supplement fish and wildlife law enforcement under the supervision of certified personnel. Additionally, the MD DNR and/or USFWS are Sikes Act partners and have authority to exercise jurisdiction.

Hunting and fishing are the primary programs with ties to natural resources law enforcement. The designated installation NRM is responsible for the direction and oversight of hunting and fishing programs. The NRM and a designated hunting coordinator oversee hunting while the 11 FSS/FSC and 11 CES/CEIE oversee the fishing program; both coordinate their operations with 11 SFS. Any violations observed by the hunting program coordinator or NRM are reported to 11 SFS or MD DNR Natural Resources Police for enforcement.

Hunting at the Brandywine and Davidsonville GSUs is limited to members of the Brandywine Bowhunters Club. No hunting occurs on the Main Base. Catch-and-release fishing is permitted at the Base Lake on the Main Base. All persons wishing to hunt or fish at JBA must possess a valid state hunting and fishing license. Persons authorized to hunt or fish must be familiar with and follow the Maryland state and federal regulations governing hunting and fishing. Any rules and/or policies for hunting and fishing at JBA established by 11 CES/CEIE must also be followed. There have been no natural resources enforcement actions in the last several years at JBA.

JBA will research the feasibility of enrolling a 11 SFS representative into the Federal Law Enforcement Training Center Land Management Police Training Program and/or enter into a law enforcement agreement with the MD DNR Natural Resources Police to enhance the conservation law enforcement capabilities of JBA.

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

Applicability Statement

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

Program Overview/Current Management Practices

Rare, threatened and endangered (RTE) species surveys were conducted at JBA in 1993, 1996, 1997, and 2004 (Ecology and Environment, Inc., 2005). The federally- and state-listed sandplain gerardia (*Agalinis acuta*) was identified during the 1994 survey but was not observed in subsequent surveys. It was, however, observed in 2002 and in recent years as part of annual monitoring activities. The plant's known habitat, located in the vicinity of the 18-hole golf course northeast of the Base Lake, is protected by fencing and signage that warns of the presence of a protected species. In addition, a "no mow" buffer surrounds the fenced area.

Based on the 2004 field survey, a Threatened and Endangered Species Survey was completed in 2005 (JBA, 2005). The document identifies federally listed species, as well as federal candidate and state-listed threatened, endangered and rare species. It also includes a Management Action Plan (MAP) for the sandplain gerardia. The plan is intended to provide for the monitoring and protection of the species and maintenance of its habitat at JBA (see Appendix D ~~H~~). The management plan consists of the following goals:

> **Goal:** Design and implement an appropriate annual monitoring plan
>
> **Goal:** Evaluate the results of the monitoring to determine the status and condition of the population
>
> **Goal:** Evaluate and implement alternative management strategies that would favor restoration / enhancement of the sandplain gerardia population

Additional objectives include expanding the population within the existing enclosure, as well as sowing available seeds in other areas of appropriate habitat if the plants in the existing habitat appear and set seed (Ecology and Environment, Inc., 2005). The management plan was augmented in September 2005 to include recommendations from MD DNR. The following guidance was recommended:

1. Outside of a 25 ft stream buffer, remove all trees from the area now enclosed that has been identified as the best suitable habitat in the vicinity of the historic sandplain gerardia population.
2. Immediately after cutting, paint stumps of cut trees with herbicide to control sprouting.
3. Mow in mid-November (after late summer grasses and forbes have set seed). Remove thatch from site.
4. Apply herbicide to multiflora rose (*Rosa multiflora*).
5. Using rake, scarify ground to expose soil in areas with little vegetative cover. Leave roughly half of the areas covered in lichens undisturbed in order to conserve some of this slow-growing lichen cover.
6. Annually monitor the encroachment of *Rubus* spp. and *Lespedeza* spp. and implement control of these species if areas with little vegetative cover are encroached upon by these invasive plants. This monitoring could be accomplished by establishing photo points for areas with little to no vegetative cover.

7. Consult a subject matter expert regarding the advisability of watering the areas of little to no vegetative cover. If this it determined to be desirable to promote germination, develop a plan for watering that identifies the locations, time of year, frequency and duration of watering.
8. Consult a subject matter expert regarding seed longevity for this species. Annual monitoring should be conducted to determine if any Sandplain gerardia is present. The final year for monitoring should be selected based upon the longevity of seeds and the number of years that have passed since this species was observed.

In 2017 JBA conducted maintenance of the sandplain gerardia management area by mowing vegetation and treating invasive species (Korean lespedeza and multiflora rose).

No other federally-listed species are known to occur on the Main Base or the GSUs. The bald eagle was identified in the 2004 field survey, but it is no longer federally-listed. Although the bald eagle is still subject to protections through other federal regulations, it is not expected to frequent the Base. Base Lake, the largest water body at JBA, lacks suitable perch trees, is relatively small and is subject to frequent human use (Ecology and Environment, Inc., 2005; USACE, 2006h).

The most recent comprehensive RTE survey conducted at JBA was in 2006, as described in Section 2.3.4. A comprehensive updated RTE survey is needed for the installation to determine the current status of rare, threatened, endangered and petitioned species and the health of their habitats at JBA. The survey should also include key wildlife habitats and SGCN as identified in the Maryland SWAP (MD DNR, 2015).

In 2015 the USFWS listed the Northern long-eared bat as threatened under the ESA; the species is also state-listed as threatened. JBA was one of 47 installations that participated in an acoustic bat survey in 2018 to identify bat species, if any, at the installation (see Section 2.3.4). The acoustic bat survey at JBA identified nine out of the ten bat species present in Maryland at JBA, 5 of which were manually confirmed. All nine species identified in the acoustic survey are SGCN in the Maryland SWAP (MD DNR, 2015). A manual bat survey is needed to confirm which species of bat are present at JBA and both GSUs, including the federally- and state-listed Northern long-eared bat and the state-endangered eastern small-footed bat.

The USFWS has been petitioned to list three species known to occur in Maryland under the ESA – the monarch butterfly, regal fritillary and yellow-banded bumble bee (USFWS, 2017). Monarch butterflies are present at JBA, but the status of the other two petitioned species is unknown at this time.

The *USAF Pollinator Conservation Reference Guide* (USFWS, 2017) recommends that monarch conservation activities be incorporated into installation INRMPs. Other recommended conservation activities include the following (USFWS, 2017, p. 43-4):

> *Managers of Air Force lands within the range of the monarch butterfly should consider coordinating with the local USFWS field office, state fish and wildlife agencies and other partners to determine priority areas for monarch conservation and for assistance in developing and implementing site-specific management recommendations and plans. They should also consider whether a CCA [candidate conservation agreement] or actions under the USFWS Voluntary Prelisting Conservation Policy (both described in Section 1.C) would be beneficial to the Air Force. Any conservation actions should be documented in the installation INRMP.*

The *USAF Pollinator Conservation Reference Guide* (USFWS, 2017, p. 43-4) provides seven conservation recommendations for monarch butterflies that are applicable to JBA:

1. Assessing monarch habitat conditions to determine priority areas for conservation on Air Force lands in consultation with the local USFWS field office, state fish and wildlife agencies and other partners.
2. Increasing native milkweed and other native flowering plants in monarch breeding areas.
3. Increasing native flowering plants along migration routes during the time of migration.
4. Maintaining open, sunny areas where native flowering plants thrive.
5. Eliminating or reducing the use of pesticides in areas with monarchs.
6. Eliminating invasive plants and nonnative tropical milkweed (*A. curassavica*), which is believed to promote the spread of disease (e.g., *Ophryocystis elektroscirrha*) in migratory monarchs.
7. Adjusting management activities (timing of mowing, amount of grazing, timing and size of prescribed fire units) so not to interfere with breeding.

JBA recently improved pollinator conservation habitat at the installation, contributing to recommendations #2, #4, #5 and #7 above. Three 1-acre butterfly waystations were installed at the Courses at Andrews in 2018 as part of the Monarchs in the Rough program sponsored by Audubon International and the Environmental Defense Fund. A fourth waystation, also approximately an acre in size, is planned for installation in FY2019. Each waystation is planted with milkweed and other wildflowers. Two pairs of honey bee hives have recently been installed at the Courses at Andrews and at Pest Management. The golf course plans to install an additional two hives in FY2019. Harvested honey will be used in the BBQ restaurant at the Courses at Andrews. The *USAF Pollinator Conservation Reference Guide* identified the Legacy Program and REPI as potential funding mechanisms for additional conservation activities.

JBA has no current Biological Opinions or ongoing consultations for T&E species under Section 7 of the ESA.

7.5 Water Resource Protection

Applicability Statement

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

Program Overview/Current Management Practices

Rivers and streams and some wetlands, ponds and lakes are protected as a subset of the “waters of the United States” under Section 404 of the CWA. As a result of federal and state regulations, as well as DoD and AF policy, JBA is responsible for identifying and locating jurisdictional “waters of the United States” (including wetlands), where these resources have the potential to be impacted by activities at the Base. Such impacts could include construction of roads, buildings, runways, taxiways, navigational aids, and other appurtenant structures or activities as simple as culvert crossings of small intermittent streams, rip-rap placement in stream channels to curb accelerated erosion, and incidental fill and grading of wet depressions.

Physical disturbances to wetlands and disturbances to both perennial and intermittent streams (e.g., stream crossings) are regulated by the CWA under Sections 404 and 401. Sometimes activities within ephemeral streams are also regulated. Most proposed activities within streams or wetlands (such as filling, dredging, or clearing of ditches) require either a general or individual permit. In general, individual permits are required for disturbances that exceed thresholds for disturbances covered by general permits. Permitting requirements vary depending on type, location, and extent of disturbance.

As a result of a USEPA ruling, MDE issued a new general permit that pertains to pesticide applications in, over or around waters of the US, and is consistent with the USEPA pesticide general permit requirements

published under 40 CFR 122. This permit covers discharges to State waters from the application of (1) biological pesticides or (2) chemical pesticides that leave a residue, when the pesticide application is for one of the following pesticide use patterns (MDE, 2011):

1. Mosquito and Other Flying Insect Pest Control
2. Weed, Algae, and Pathogen Control
3. Nuisance Animal Control
4. Forest Canopy Pest Control

In addition to pesticides, JBA handles other hazardous materials, including: herbicides; solvents; petroleum, oils, and lubricants (POLs); paints; and deicing fluids. JBA's Hazardous Materials (HAZMAT) Pharmacy Program receives partially used hazardous materials which can then be used by others who require only small quantities. Operation of a large airfield involves the acquisition, use, and ultimate disposal of these hazardous materials. As a result, JBA is listed by the USEPA as a Large Quantity Generator. This classification requires submittal of a bi-annual report to USEPA on hazardous materials that are generated at the Base.

Historical methods of hazardous waste disposal at JBA have resulted in contamination of surface waters, groundwater and soils. Remediation of past contamination is the focus of the Environmental Restoration Program, which is administered by JBA under the under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, aka "Superfund") guidance. The ERP was established to identify, assess, investigate, and clean up existing contamination on the Base. There are currently 60 ERP sites located at JBA. Cleanup efforts include many individual sites both on and off Base.

Other natural resource management issues pertaining to wetlands and streams are the need to limit the creation of new wetlands, as they can attract birds, and the need to mitigate stream bank erosion. The 2003 MOA to Address Aircraft-Wildlife Strikes (see Section 7.12 and Appendix G) facilitates coordination with USFWS to address wetland mitigation projects that may pose a BASH issue. In addition, coordination between JBA and USFWS can address needed stream restoration measures on the Main Base. Stream channel erosion can be caused by inadequately controlled stormwater runoff. Streams on the Main Base, and the areas immediately adjacent to the streams, generally comprise the floodplains (see Figure 24), making stormwater control the primary floodplain management issue at JBA. Several BMP projects are identified in the 2017 Stormwater Management Plan for JBA, including stream restoration.

7.5.1 Stormwater Management

Stormwater runoff can be a significant source of pollutants and sediment into surface waters, especially in areas where groundcover has been disturbed. Water quality also may be negatively impacted by disturbances causing increased sedimentation to wetlands and stream channels. Stormwater runoff from impervious surfaces on Base has a high potential to carry pollutants into wetlands, surface water and groundwater.

JBA must comply with various water quality requirements and regulations, including the CWA National Pollutant Discharge Elimination System (NPDES) stormwater program, the Maryland Stormwater Management Guidelines for State and Federal Projects, the Energy Independence Security Act Section 438, EO 13508 *Chesapeake Bay Protection and Restoration*, the Chesapeake Bay TMDL requirements, and the Maryland Watershed Implementation Plan (WIP).

JBA has a Stormwater Pollution Prevention Plan, updated in 2015, that identifies potential sources of pollution that may be reasonably expected to affect the quality of stormwater discharges at JBA. The plan also serves to ensure the implementation of practices that are to be used to reduce the pollutants in stormwater discharges and to ensure compliance with the terms and conditions of the Base's NPDES permits (JBA, 2015a).

The SWPPP is also intended to provide information that can be used to identify and implement proposed BMPs to comply with the Chesapeake Bay TMDL. A TMDL (total maximum daily load) is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Under section 303(d) of the Clean Water Act, states are required to develop lists of waters that are too polluted ("impaired waters") to meet required water standards. The law requires that TMDLs be developed for these waters.

On 29 December 2010, EPA issued the final rule regarding the Chesapeake Bay TMDL. The TMDL was established to counter the insufficient progress made towards improving the continued poor water quality in the Chesapeake Bay and its tidal tributaries. The Bay TMDL identifies the necessary reductions of nitrogen, phosphorus, and sediment and it sets required deadlines for compliance through the year 2025. The TMDL requires that municipalities, federal government, and industries improve the quality of stormwater runoff and it establishes specific goals for stormwater treatment. Specifically, JBA will be required to provide stormwater treatment for 20 percent of the existing impervious areas on the Base (Los Alamos Technical Associates, Inc. and URS Group, Inc., 2011).

The Maryland WIP was developed to address implementation of Maryland's part of the Chesapeake Bay TMDL (MDE, 2010). Phase II of the WIP identified 2-year programmatic milestones for JBA, which JBA has met (MDE, 2012b).

As identified as a programmatic milestone, JBA worked with the U.S. Army Regional Environmental Coordinator (REC) and the National Defense Center for Energy and the Environment (NDCEE) on an extensive assessment project to help JBA identify applicable Chesapeake Bay TMDL requirements and prepare JBA to meet them. In 2013 Concurrent Technologies Corporation, on behalf of NDCEE and JBA, conducted a TMDL Baseline Assessment for the installation (Concurrent Technologies Corporation, 2013a). The TMDL Baseline Assessment Report describes installation non-point source loading and modeling to calculate baseline loads with no stormwater BMPs in place at JBA. The baseline loads differed than those calculated by MDE for the installation due to the incorporation of more detailed land use data on Base. The TMDL Baseline Assessment Report identifies load reductions needed to achieve MDE's Target Loads considering both baseline load results (Concurrent Technologies Corporation, 2013a).

The results of the TMDL Baseline Assessment Report were then used to evaluate stormwater BMPs for JBA (Concurrent Technologies Corporation, 2013b). Goals established by MDE to comply with Chesapeake Bay TMDL requirements state that the installation must implement BMPs by 2017 to treat 20% of the impervious urban acreage that was untreated in baseline year 2010. Additional urban BMPs must be implemented by 2025 to further meet load reductions. The Concurrent Technologies Corporation (2013b) evaluation of JBA's progress towards meeting these goals found that the Main Base had already met the 2017 goal and that the Davidsonville and Brandywine GSUs required treatment for 0.3 impervious acres and 0.2 impervious acres respectively according to the MDE Reduction Calculator. Additional load reductions to meet the 2025 goal were identified (Concurrent Technologies Corporation, 2013b).

Concurrent Technologies Corporation then conducted an evaluation of future BMPs needed for JBA to meet TMDL requirements (Concurrent Technologies Corporation, 2013c). The Future BMP Evaluation for JBA identified BMP opportunities at the installation to reduce the installation's nutrient and sediment

loads to the Chesapeake Bay. The BMPs were prioritized based on their effect on water quality, ease of implementation and cost. JBA's potential progress towards meeting the 2017 and 2025 TMDL goals if the BMPs were implemented. Continued coordination with MDE during Phase II WIP implementation was recommended to resolve the land use data discrepancies used by NDCEE and MDE assessments (Concurrent Technologies Corporation, 2013c).

JBA updated the SWPPP in 2015 and the SWMP in 2017, incorporating the findings of the TMDL assessments. Improvements to stormwater systems on the installation continue to occur or are in planning. Leadership in Energy and Environmental Design (LEED) certification and LID under the Energy Independence and Security Act of 2007 (EISA) have been incorporated into the IDP as a means to manage stormwater for all construction and maintenance projects. Stormwater management features continue to be integrated into facility construction projects, most recently those developed for the PAR project (JBA, 2017c).

7.5.2 Erosion and Soil Conservation

Erosion control and soil conservation are important water resource conservation issues. Accelerated erosion, continued compaction, or the removal of topsoil can drastically alter soils. Sediment accumulation resulting from erosion affects surface water quality and aquatic organisms. JBA complies with the state's soil erosion and sediment control regulations. MDE must approve sediment and erosion control and stormwater management plans if total disturbed area is more than 5,000 square feet or 100 cubic yards in size. JBA must also comply with MDE General Permit for Stormwater Associated with Construction Activity, Permit # 09GP if the project disturbs more than one acre of land. Disturbed area includes all areas disturbed during construction, including equipment movement and storage and supply lay-down areas, not just the building footprint (Los Alamos Technical Associates, Inc. and URS Group, Inc., 2011).

7.6 Wetland Protection

Applicability Statement

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

Program Overview/Current Management Practices

The status of wetland inventories and delineations is described in Sections 2.2.4.3 and 2.3.5.1. Wetlands at JBA are affected by invasive species, future development plans, incompatible land use with the airfield and BASH management needs. Natural resources management of wetland resources at the installation must be balanced with the military mission.

JBA has a Water Program Manager who facilitates wetland and stream restoration projects on Base. In the past the Base undertook stream restoration projects on Cabin Branch, Meetinghouse Branch and a section of Piscataway Creek located near the end of the runway (MNCPPC, 2009). IAW the Maryland Nontidal Wetlands Protection Act, JBA maintains a 25-foot buffer around delineated wetlands on the installation.

The *Compensatory Mitigation for Losses of Aquatic Resources, Final Rule* (33 CFR Part 332), released by the USEPA and the USACE in April 2008, establishes a standard for wetland replacement projects that are required to comply with the Clean Water Act. The Rule is designed to improve mitigation practices to meet the national goal of "no net loss" of wetlands in the CWA Section 404 permit program.

The Final Rule directs selection of mitigation sites based on the needs of the host watershed and requires an analysis of how a project will address those needs. JBA, in consultation with the USACE and MDE, will determine the preferred method of compensatory mitigation for unavoidable WUS and wetland losses during the Section 404 permit review process. The selection of a compensatory mitigation method will follow the *2008 Compensatory Mitigation Rule* sequence and will satisfy the requirements of said rule.

JBA previously conducted a wetland restoration and enhancement project near the southern border of the Main Base in the Piscataway Creek watershed (MNCPPC, 2009). In 1998 JBA completed an on-Base wetland mitigation project for 2.04 acres of nontidal wetlands impacted by the construction of the South Golf Course. The project converted two acres forested wetlands to scrub-shrub or emergent wetlands by clearing trees to create fairways or open rough close to the fairways. The mitigation created 2.12 acres of forested wetlands and revegetated 0.92 acres of nontidal wetland buffer within the same upper Piscataway Creek watershed. The wetland mitigation site is contiguous to the eastern edge of the pond southeast of Base Lake, between holes S9 and S10 on the South Golf Course. The site was designed as a shallow area with seasonal inundation and to be connected to an intermittent tributary to Piscataway Creek. Post-construction monitoring was conducted in November 1998 by Tetra Tech NUS Inc., but no information is available regarding more recent monitoring or management activities (Tetra Tech NUS, Inc., 1999). The wetland mitigation area should be included in any updated, comprehensive wetland surveys of the Main Base.

In 2016 JBA initiated compensatory wetland mitigation off-Base at the Piscataway Creek Mitigation Site (see Section 2.4.3). An UMBI was established for JBA and other DoD installations in Maryland in 2017 (JBA, 2017d). Anticipated future wetland impacts will seek compensatory mitigation at the Mattawoman Creek Mitigation Site off-Base (JBA, 2017c; GreenVest, 2017).

JBA has an existing CWA Sections 404 and 401 permit for the repairs project at the West Runway, with compensatory mitigation at the PCMS, and for the MCMS. A joint Federal-State CWA Sections 404 and 401 permit is pending for the PAR project.

7.7 Grounds Maintenance

Applicability Statement

This section applies to AF 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 includes mowing, fertilization, herbicide and pesticide application, and watering, as needed. Grounds maintenance and landscaping is performed in accordance with federal and state laws and regulations. JBA also carries out these activities in accordance with the Arbor Plan, IPMP, and the BASH Plan.

The Arbor Plan summarizes Base forestry history, identifies priority areas for planting, and describes clearance zone requirements for the airfield as well as AT/FP standards (JBA, 2011). The Arbor Plan serves as a tool to assist the Environmental Element of the Civil Engineering Squadron in reinforcing the policies laid out in the INRMP that require all new construction on Base to replant 60% of the canopy lost during development. The Arbor Plan assists in determining replanting requirements and associated planting areas to address the impacts. A plant database of recommended species of trees and landscape design guidelines for their planting are also provided in the Arbor Plan.

JBA removed 274 trees in FY2017 and 119 trees in FY2018. In FY2018, 14 trees were planted on the Main Base. Tree trimming is performed annually base-wide on the Main Base. Additional information about the Arbor Plan can be found in Section 7.8 *Forest Management*. The Arbor Plan was last updated in 2011 and is in need of an update to reflect the current extent and management needs of forest and tree cover at JBA, including the incorporation of arbor management at the Brandywine and Davidsonville GSUs.

The IPMP describes strategies for treating trees and shrubs that are infested by insects and techniques to control fungi and turf diseases that can damage lawns and golf course turf. The grounds maintenance service contractor may periodically apply herbicides to control unwanted crack grass along streets and fence lines; herbicides may also be used to improve turf areas through the use of broadleaf weed control. Section 7.11 further describes the IPMP.

The BASH Plan specifies grounds maintenance measures to reduce wildlife attractants, including managing airfield grass height, controlling broad-leafed weeds, planting sparsely vegetated areas, selective fertilizing, removing the "edge effect" around the airfield, selective application of pesticides to remove rodents from the airfield, and removing dead vegetation (JBA, 2014a). Section 7.12 further describes the BASH Plan.

Grounds maintenance activities at JBA are conducted by both Base and contract personnel. No arbor maintenance activities are regularly performed by Base personnel at either the Brandywine or Davidsonville GSU, but the Brandywine Bowhunters Club conducts volunteer work details to clear and maintain trails and parking areas at both GSUs.

Base personnel from 11CES/CEOES perform grounds maintenance of the airfield and National Executive Route. Weeds along fence lines, on road shoulders, and paved surfaces (including sidewalks and parking lots) require control using both mechanical and chemical means. Control may be conducted using appropriate herbicides, mowing, trimming and other mechanical methods. Herbicides must be applied by 316th CES personnel but other control measures may be performed by other unit personnel under the jurisdiction of building custodians or detail leaders (JBA, 2018a).

Trees and shrubs on JBA can be infested by various insect pests, resulting in damage or destruction of plants. Tent caterpillars, fall web worms, bag worms, and Japanese beetles cause major problems annually. Fungi and various turf diseases are the major cause of damage to lawns and the golf course, requiring continuous surveillance and control (JBA, 2018a).

Tree and shrub pests are normally treated by 316th CES with residual pesticides. Heavily infested sections may be cut out or entire plants replaced. During the winter, surveys are conducted to find and remove bag worms. Golf Course maintenance personnel treat turf pests on the golf course with various fungicides. Other control techniques include careful watering, proper mowing, dethatching and aeration, and planting resistant strains of turf (JBA, 2018a). Non-point source pollution issues associated with landscape pesticides and fertilizers are addressed in the JBA Stormwater Pollution Prevention Plan (JBA, 2015a).

Starting in 1997, the golf course ground maintenance replaced the cool season grass located on the fairways and some tee boxes with a warm season grass. This was completed because warm season grass requires fewer pesticides and reduces irrigation needs by one-third. Bat houses were also place on the golf course to control insects, which in turn reduces the use of pesticides. Ground maintenance at the golf courses at JBA is typical of any commercial golf course; however, "no mow" areas have been established to create buffers around sensitive environmental resources (i.e., streams, ponds, and the location of the RTE sandplain gerardia). There are approximately six acres of tees, nine acres of greens and 60 acres of fairways that are maintained at the three golf courses (JBA, 2018a).

The golf course is irrigated using the water from Base Lake (Freedom Lake). In the past, water level was difficult to maintain during peak irrigation days because only a single well pumping 135 gallons per minute (gpm) was used to replenish the lake. However, in 2003 a second well capable of pumping 400 gpm was installed to maintain lake's water level during peak irrigation.

In 2018 the golf courses installed three approximately 1-acre butterfly waystations as part of the Monarchs in the Rough program sponsored by Audubon International and the Environmental Defense Fund. Milkweed and other wildflowers were planted to provide habitat for pollinators. A fourth waystation is planned for installation in FY2019. The golf courses have also recently installed two bee hives near Base Lake with plans to install two more and use harvested honey at their restaurant. The *USAF Pollinator Conservation Reference Guide* provides additional plant recommendations to create pollinator habitat (USFWS, 2017).

The Courses at Andrews posts public notices on their Twitter feed and their website in advance about chemical applications and the locations affected. Fungicides may be applied for treatment of turf pests. Turf on the fairways may be managed for growth with fertilizers and/or weed control chemicals. Weed control may be treated with non-chemical or chemical means (e.g., pesticides, herbicides, fertilizers). Non-chemical control methods include maintaining fertility, irrigation and good soil drainage. 11th Force Support Squadron (FSS) Golf Course Maintenance is the responsible organization for grounds maintenance at the Courses at Andrews (JBA, 2018a).

No solid wastes are generated by grounds maintenance activities at JBA. Grass is mulched as it is mown, and tree trimmings are chipped and used as mulch in ornamental beds. There are no mulch or compost piles at the installation.

Grounds maintenance in the privatized housing area, Liberty Park at Andrews, is conducted by Clark Realty. Liberty Park's landscapers perform mowing, edging and trimming of bushes, trees and common areas within the privatized housing area; residents are responsible for mowing any yards that are fenced and for maintaining any landscaping flower beds at their residences.

11CES/CEOES oversees the grounds maintenance service contract and its modifications, as needed. The most recent base year of the service contract was 01 December 2016 to 30 November 2017. The service contract has four option years, though November 2021, plus a 6-month extension option to 31 May 2022. The service contract for grounds maintenance of the remaining areas on the Main Base, plus a few localized areas around several buildings inside the Pathfinder fence at the southeast and east areas of the airfield, divides the grounds into Unimproved, Improved and Semi-Improved areas. Contracted services include mowing, trimming, edging, removal of leaves and debris, weed control, encroachment and crack grass maintenance, and removal of trees, shrubs and stumps. The contractor is also responsible for maintaining mulched landscaping beds, trees, hedges and shrubs; mowing and trimming bio-retention ponds, drainage ditches, storm water management filters, and athletic fields; and the Base perimeter impasse fence and unimproved fence line on the Main Base. Snow and ice removal is also performed by the contractor during the winter months.

Approximately 341.31 acres of the JBA Main Base are designated as Improved grounds. The contractor shall maintain grass height on Improved grounds between two to four inches depending upon the type. The height is a guideline for a neat and professional appearance. The contractor shall be required to pick up debris, natural and man-made, prior to mowing any area. Grass clippings shall be removed or mulched when visible after mowing before leaving the work area. Mowing shall be accomplished free of scalping, rutting, bruising, uneven or rough cutting. Grass clippings shall be removed from all roads, parking areas, walks and mulch beds. The contractor shall water, edge, eliminate weeds, maintain mulch and repair or

replace plants in approximately 3.04 acres of shrub and plant beds located on Improved grounds. All improved grounds shall have a well-manicured look at all times.

The grounds maintenance service contractor shall also maintain the grounds surrounding approximately 11,182 linear feet of perimeter fence line to the same standards as the Improved grounds. Perimeter fence improved grounds include five feet outside and up to the fence and ten feet inside and up to the fence. The contractor shall trim each side and remove all vegetation. The contractor shall dispose of debris in dumpsters located at Building 3257. The contractor shall not dispose of debris by throwing over the fence or into adjacent fields. All weeds shall be removed or eradicated manually, mechanically, or with the use of herbicides (only when approved by the Base Entomologist).

Grounds maintenance of the approximately 157 acres areas categorized as Semi-Improved have a mowing height of four to ten inches. The contractor shall be required to pick up debris, natural and man-made, prior to mowing any area. Grass clippings shall be removed from all roads, parking areas, walks and mulch beds. The central open areas at the Brandywine and Davidsonville GSUs, near the antennae arrays and buildings, are categorized as Semi-Improved and maintained accordingly by the contractor.

Areas designated as Unimproved include approximately nine acres on the Main Base, 7.86 acres along Base fencelines, and approximately 530 acres at Brandywine (260) and Davidsonville (270) GSUs. Unimproved areas have a mowing height of 10 to 14 inches. Unimproved grounds are all grounds not classified as improved or semi-improved where mowing is to be done on a once-a-year basis or growing season dependent, however is not to exceed 24 inches in height, to control pests, erosion, and eliminate fire hazards. Areas in this classification encompass weapon ranges, road shoulders in undeveloped areas, forest lands, grazing lands, lakes, ponds, wetlands and areas in airfields beyond the safety zones. Grass cutting near the OMNI (Monopole OMNI directional antennas) via mechanical means is discouraged. Recommend the use of herbicides (prior approval by the Base Entomologist is required) or cloth ground cover in controlling vegetation in these areas. The majority of the open, non-forested areas at the Brandywine and Davidsonville GSUs are considered Unimproved areas and maintained accordingly.

7.8 Forest Management

Applicability Statement

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

Program Overview/Current Management Practices

Information about the forest vegetative communities at JBA is provided in Section 2.3.2. The main forest community types found at Main Base and the two GSUs are mixed hardwood forest, mixed hardwood/pine forest, oak forest, oak/hickory forest, and pine forests.

The 2011 Arbor Plan is designed to be used as a guide to landscape development, reforestation and maintenance of forest resources at JBA. It is an update to the 2004 Arbor Plan. The 2011 plan calculates the forest stand loss since 1958 (see Section 2.3.2) and provides guidance to mitigate these losses, consistent with Prince George's County's Woodland and Wildlife Habitat Conservation Ordinance. It identifies priority planting areas in the form of corridors, gateways and reforestation plans, and it recommends plant materials and design guidelines to achieve the following goals:

- Help offset the loss of forest stand which has occurred over the past 30 years (approximately 60 percent of these losses returned by implementing the Arbor Plan)
- Sustain the ecological values and the function of the forested landscape
- Integrate forest management activities with the management of base natural resources and the military mission of JBA
- Promote non-fragmented ecological communities and biodiversity while addressing the challenge of encouraging habitat that is in conflict with the mission
- Meet EMS and INRMP objectives in enhancing open space and natural areas
- Enhance the aesthetic and ecological value of the Base where possible

To ensure compliance with airfield clearance zone requirements, the Arbor Plan stipulates that JBA shall perform a tree survey not less than once every three years to identify trees that extend into restricted distances from airfield clearance zones and therefore require removal or trimming (JBA, 2011). All tree removal and/or pruning activities are required to be performed in accordance with the Arbor Plan's design and maintenance guidelines. Consistent with the 2004 Arbor Plan recommendations for airfield clearance zones, JBA continues to coordinate as necessary with other agencies, including the National Park Service, to manage the tree canopy on adjacent properties.

Primary threats to existing forest stands are wildfire, insects and disease. Fires have been minimal and are managed by the JBA Fire Department with assistance from local volunteer fire departments and the Maryland Forest Service (MFS). Gypsy moth, Emerald ash borer and southern pine beetle are the insects that pose the greatest threat. Gypsy moths (*Lymantria dispar)* defoliate the oaks and can cause a reduction in canopy shade and extensive forested areas. Emerald ash borers (*Agrilus planipennis*) destroy ash trees and reduce the native diversity of forests. Southern pine beetles (*Dendroctonus frontalis*) often attack pine tree stands which are under stress. Potential tree diseases include anthracnose, annosus root rot, and oak wilt. The MFS and Maryland Department of Agriculture provide support for insect and disease detection, identification; JBA will establish a joint agreement with these state entities for insect and disease control, when necessary.

In 2008 a Vegetation Management Plan was prepared by Dewberry and Davis LLC for the JBA Main Base, which included a LiDAR and aerial imagery survey of the tree canopy in the north and south areas on the Main Base to identify vegetation encroaching on the glide slope ceiling (imaginary airfield surfaces) for the East and West Runways (Dewberry and Davis, 2008). The tree survey area encompassed approximately 8,000 acres on or immediately surrounding the installation boundary. The project identified vegetation and on-vegetative obstructions to the imaginary surfaces and those obstructions that violated the "10-foot rule" as stated in Unified Facility Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* (i.e., obstructions within ten feet of the imaginary surface). The survey identified 297 individual vegetative obstructions covering a total approximate area of 88.685 acres. Management areas for mitigation of the vegetative obstructions were prioritized and tree trimming was conducted to manage the obstructions.

The USACE Baltimore District prepared the *Tree Survey JBA – Naval Air Facility, Washington, Maryland* in January 2011 to identify tree obstructions to runway operations at JBA in accordance with UFC 3-260-01 and Federal Aviation Regulations (FAR), Part 139 for Class B airfields (USACE, 2011). The USACE Tree Survey (2011) built upon the data from the 2008 Vegetation Management Plan (Dewberry and Davis 2008) and also includes data from vegetative obstructions in and around Suitland Parkway immediately adjacent to the Main Base and owned and managed by the NPS that were identified in a 2009 study by

TreesAmerica (TreesAmerica, 2009). In agreement with the NPS and TreesAmerica, JBA developed a tree management plan to limit the pruning and mitigation of tree obstructions within five feet of the imaginary surfaces, as opposed to the ten feet advised in UFC-3-260-01 guidance, in the Suitland Parkway management area.

The 2011 Tree Survey inventoried each potential tree obstruction into the glide slope ceiling within 384 forested acres on the Main Base and immediately off-Base at both the north and south ends of the runways (USACE, 2011). Each tree that had or was likely to penetrate the glide slope ceiling was geo-located, tagged and field data was collected for each tree. The collected forestry data were organized in a format compatible with the JBA geo-base for easy manipulation for forestry management planning, Base planning, and United States Standard for Terminal Instrument Procedures (TERPS). Tree trimming was conducted based on the 2010-11 Tree Survey to mitigate the 21 trees identified as penetrating the imaginary surface and 89 trees identified within ten feet of the imaginary surface.

In late FY2018 JBA initiated a project to update the 2010-11 tree survey to identify current obstructions to the approach / departure surfaces (glide slopes) for the East and West Runways on the Main Base. Results from this project will be used to update the Vegetation Management Plan for the Main Base and/or the MOU between JBA, NPS and the State of Maryland for vegetation management in the Suitland Parkway portion of the glide planes as needed (Appendix C). Roughly one-third of the glide planes are on Base and managed as mowed turf areas, one-third is within the Suitland Parkway management area, and the remaining third is a mix of developed areas, forest cover, and shrub/scrub on Base.

The Suitland Parkway management area is a mix of mowed fields and shrub/scrub, including invasive species such as sumac and Bradford pear. The portion of the approach light planes for the East and West Runways that is within the Suitland Parkway management area will be converted into meadow, providing a long-term mitigation of vegetation obstructions and an opportunity to enhance pollinator habitat consistent with recommendations outlined in the *USAF Pollinator Conservation Reference Guide* (USFWS, 2017). Following conversion of the approach light planes within the Suitland Parkway management area to meadow, JBA plans to develop a forestry plan with the NPS and State of Maryland to alter the tree species within the management area to species that do not pose an encroachment hazard to the light planes.

The combination of small acreage, dispersed location of forested areas in a highly urbanized region, and ecosystem management objectives makes intensive forest management practices for commercial timber production impractical at JBA. There is no forestland available for timber management on a planned rotation basis with minimum restrictions (i.e., regulated commercial forestland).

JBA is recognized by The National Arbor Day Foundation as a Tree City USA. To maintain this status, the installation must meet four standards established by The National Arbor Day Foundation and the National Association of State Foresters. These standards include development of a tree board or department, a tree care ordinance, a community forestry program that is supported by an annual budget of at least $2 per capita, and an Arbor Day observance and proclamation.

The Arbor Plan was last updated in 2011 and is in need of an update to reflect the current extent and management needs of forest and tree cover at JBA, including the incorporation of forest resources at the Brandywine and Davidsonville GSUs (Figures 51, 52 and 53).

Figure 51. Forest areas at JBA Main Base.

Figure 52. Forest areas at the Brandywine GSU.

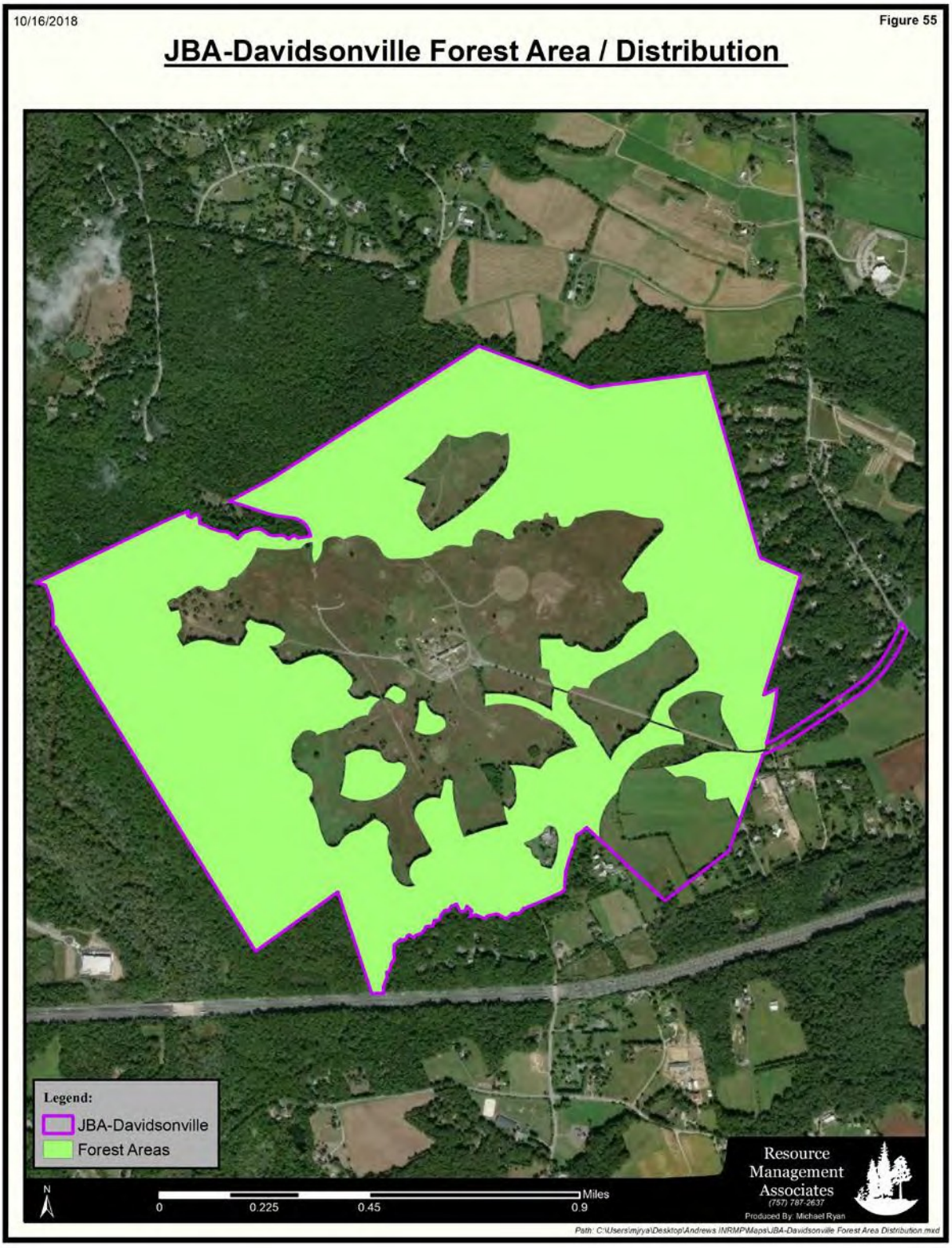

Figure 53. Forest areas at the Davidsonville GSU.

7.9 Wildland Fire Management

Applicability Statement

This section applies to AF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section not applicable to this installation.

Program Overview/Current Management Practices

Wildfire is not a significant issue at JBA. No controlled or prescribed burns are practiced. Any fires on the installation are the responsibility of the JBA fire department with assistance from the local volunteer fire departments and the Maryland Forest Service if necessary.

The Arbor Plan discusses the potential use of prescribed burning on JBA property if needed to reduce hazardous fuel accumulation and the threat of wildfires in pine stands (JBA, 2011). Prior to determining the need and execution of a prescribed burn, AFCEC and/or AMC foresters will provide support and coordination with the Maryland Forest Service to determine prescribed burning requirements. Additionally, the impacts from prescribed burning on all resources, including wildlife, protected species and habitats, forest cover type, riparian areas, air quality, and aesthetics, will be assessed in order to maximize the beneficial effects.

7.10 Agricultural Outleasing

Applicability Statement

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

Program Overview/Current Management Practices

There are no lands owned or managed by JBA that are leased for agricultural purposes. Historically one 39-acre parcel on the southeastern corner of the Davidsonville GSU was leased to local residents for agricultural use, but the lease was terminated around 2000 and has not been renewed since that time.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to AF installations that perform 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

Integrated pest management (IPM) is the use of multiple techniques in a compatible manner to avoid damage and minimize adverse environmental affects while obtaining control of target pests. The goal of IPM is to utilize non-chemical procedures, to the extent possible, to control pests, including both invasive and exotic plant and animal species. Typically a combination of the following IPM techniques is required to resolve a problem on a sustained basis:

- Mechanical control, which alters environments in which pests live, traps or removes pests (i.e. glue boards and live-traps) from where they are not wanted, or excludes pests from where they are not wanted (i.e. screening);
- Cultural control, which manipulates environmental conditions to suppress or eliminate pests (i.e. filling in depressions in the ground to prevent standing pools of water);
- Biological control, which uses predators, parasites, or disease organisms to control pests (i.e., use of milky spore to control Gypsy moth and Japanese beetle larvae on Main Base);
- Chemical control, which relies on pesticides and/or herbicides to kill pest and/or undesirable species of plants.

The IPMP includes pest identification and management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety, and environmental requirements of the program. Environmental considerations addressed in the plan include pest control operations in sensitive natural areas, endangered/protected species and critical habitats, pesticide spills and remediation, and pollution prevention (JBA, 2018a).

Invasive plant species and noxious weeds are present at JBA and are included in the IPMP (JBA, 2018a). EO 13112 requires federal agencies to provide for restoration of native species and habitat conditions in ecosystems that are affected by invasive species. Invasive species at JBA are listed in Section 2.3.2. The 2006 Invasive Species Report (USACE, 2006c), kept on file with the 11CES/CEIE, contains a description of each species that was known at the time and provides potential management strategies.

Common reed (*Phragmites communis*) has become a very destructive weed in Maryland, quickly displacing desirable plant species such as wild rice, cattails, and native wetland orchids. Invasive stands of common reed eliminate diverse wetland plant communities and provide little food or shelter for wildlife. Common reed is prevalent along drainages and streams in the southern portions of the Main Base. A schedule has been developed (twice a year) for the removal of the common reed in various areas of the Main Base; however, staff limitations have prevented treatment at the GSUs.

Japanese honeysuckle is problematic due to its ability to outgrow and shade native vegetation. JBA applies herbicides to control the growth of the Japanese honeysuckle along the Main Base's perimeter fence.

Invasive species of tall fescue, Korean lespedeza, and multiflora rose have been documented in the endangered sandplain gerardia management plot. These invasive plants quickly dominate natural communities by out-competing native vegetation for resources. As a result, the quality and productivity of endangered species' habitat are directly affected. The management plan for the sandplain gerardia includes the removal of undergrowth, including the removal on invasive species. Two acres of Korean lespedeza and multiflora rose were treated in the sandplain gerardia management area in 2017.

In 2017 Main Base invasive species control was conducted on ten acres, one acre of old invasive species material was removed, and a walkthrough survey and improvements were conducted on 40 acres of forest. Species controlled and/or removed included English ivy, privet, Tree-of-heaven, bamboo, Korean lespedeza and multiflora rose.

There are currently six plant species that have been designated as noxious weeds in Maryland: plumeless thistle (*Carduus acanthoides*), musk/nodding thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), shattercane (*Sorghum bicolor*), and johnsongrass (*Sorghum halepense*). Maryland law requires landowners to manage noxious weeds on all types of land. None of these plants have been identified at JBA.

JBA is subject to the provisions of MDE General Permit for Discharges from the Application of Pesticides, General Discharge Permit Number 11PE, which the installation renews as needed.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

This section applies to AF 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

Several species consistently pose a BASH (Bird/Wildlife Animal Strike Hazard) risk. Located in the Atlantic Migratory Flyway with several wildlife refuges in the local flying area, JBA is a stop-over zone for thousands of migratory birds. Historically, small birds such as killdeer, starlings, blackbirds and swallows have accounted for the vast majority of bird strikes near JBA. Although fewer in number, larger gulls, geese and birds of prey also pose a hazard to aircrews operating in the area (JBA, 2014a). Deer and small mammals have also been a hazard on the airfield. Habitats that attract these birds and mammals include the Base Lake to the south, the Belle Chance site to the northwest, landscaping and natural vegetation associated with the golf course, dense stands of trees at the southeast edge of the airfield, ornamental trees throughout the Main Base, and forested areas on and near the airfield. Adjacent to the Davidsonville Transmitter Station, the Patuxent River serves as a major migratory and local movement corridor for birds in the region.

In addition to general fish and wildlife management, there are management needs associated with minimizing air strikes and BASH-related risk since JBA's primary military mission is based on flying missions.

The 89 AW actively implements a BASH Plan at JBA in order to reduce the potential for strike hazards by resident and seasonal birds and by other species of wildlife. The BASH plan identifies specific hazards (types of wildlife and natural resource attractants) and local conditions, as well as the process, responsibilities, available techniques, legal requirements and management recommendations. Implementation of specific portions of the plan is continuous, while other portions will be implemented as required by bird or other wildlife activity (JBA, 2014a).

JBA annually renews wildlife depredation permits that are issued by the MD DNR and USFWS. The permits are used to control BASH risk species such as Canada geese and deer, as well as injured, sick or nuisance animals that could impact the military mission at JBA. State and federal BASH permits obtained by 11 CEA/CEIE for direct control activities are MD DNR Wildlife Damage Control (55805 and 55806), USFWS Eagle Depredation (MB21620B-0), and USFWS Depredation at Airports (MB800952-0) permits. Annual reports are prepared and submitted to the appropriate agency as directed in each permit.

Table 15 shows the number of birds and nests that have been removed by non-lethal and lethal means over the past five years. Although migratory birds, as shown in the table, are protected by the Migratory Bird Treaty Act, the permits allow a maximum number of birds to be killed, hazed, trapped and/or relocated (referred to as "take") in a season. The annual USFWS Depredation at Airports Permit authorized up to 2,470 individual takes in 2013 and 2014, which declined to 1,260 in 2015, 1,775 in 2016 and 1,940 in 2017. Only a fraction of the authorized take has been taken in actuality each year, typically between 7 and 15%.

The BASH Plan identifies non-lethal methods of addressing migratory birds, such as draining standing water that accumulates after rainstorms to remove a potential habitat for migratory birds and adjusting flight

arrival and departure times during migratory bird seasons to reduce the potential for airstrikes. Other habitat management activities conducted at JBA to mitigate BASH include clearing excessive vegetation growth from the airfield drainage systems, removing landscaping plants from the clear zone area, installing bird spikes to airfield localizers, applying pesticides to the airfield to control rodent populations, and attempting to maintain the appropriate airfield grass height to limit the habitat suitability for hazardous wildlife species.

JBA partners with the USDA Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) to conduct direct control of wildlife to mitigate BASH risk. The airfield, Base golf courses and additional green areas near the flightline are patrolled by airfield management, Flight Safety, CE Pest Management and/or USDA APHIS-WS multiple times each day and birds are dispersed from areas of concern. Approximately 29 propane cannons at various locations around the airfield are utilized to disperse birds and wildlife. Border collies have been used to clear waterfowl and other birds from the airfield, golf courses, green areas, ponds and standing water areas. Pyrotechnics (15-millimeter bird bangers and screamers) are used to harass birds to clear areas of concern on an as needed basis; when utilized, multiple rounds are used multiple times a day depending on the bird activity. Kevlar wire grids have been installed on four ponds at JBA. Egg addling and nest destruction of resident Canada goose and mallard duck nests have also been conducted to mitigate BASH.

In FY2016, USDA APHIS-WS personnel conducted over 5,000 direct control events where wildlife individuals were dispersed, avoided, released and/or relocated. Starlings, raptors, columbids (e.g., pigeons and doves), and gulls were the five wildlife guilds most frequently involved in direct control events. In FY2017, USDA APHIS-WS conducted over 14,000 direct control events at JBA. The four guilds most frequently involved in direct control events in FY2017 were icterids, columbids, shorebirds and waterfowl.

The 2003 *MOA Between the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture to Address Aircraft Wildlife Strikes* promotes coordination by the signatories on major activities of concern, including but not limited to: airport siting and expansion, development of conservation/mitigation habitats or other land uses that could attract hazardous wildlife to airports or nearby areas; and responses to known wildlife hazards or aircraft-wildlife strikes. The MOA allows JBA to evaluate and comment on off-site BASH risks, including proposed wetland mitigation projects in development proposals (Johnson, 2012a).

There was an increase in the number of annual bird / wildlife aircraft strikes at JBA from FY2013 to FY2017, with a decline in FY2018 (Table 16). The third and fourth quarters of the fiscal year, or the late spring and summer months, have the most strike events. The number of strikes is lower during the fall and winter months (Quarters 1 and 2 of the fiscal year). Most of the strikes between FY2013 - FY2018 have been with passerine birds (i.e., birds that perch like songbirds), with waterbirds and mammals comprising the second and third most common strike hazards at JBA. Other strikes have occurred with raptors, insects, icterids (e.g., cowbirds, grackles, blackbirds), columbids and some unknown wildlife.

In FY2016, strikes caused more than $700,000 in aircraft damages and involved turkey vulture, Eastern meadowlark, unknown gull species, barn swallow, chimney swift, least sandpiper, osprey, yellow-rumped warbler, ring-billed gull and Savannah sparrow. Aircraft damages exceeded $195,550 in FY2017, with strikes involving osprey, shorebirds, pigeons / doves, falcons, barn wallow, chimney swift, yellow-rumped warbler, American robin, barn owl, Savannah swallow, European starling, horned lark, Eastern meadowlark, laughing gull, killdeer, American kestrel, bats, bank swallow and unidentified species. None of the 48 strikes in FY2018 were damaging.

Table 15. Annual bird take activities on JBA Main Base, 2013 – 2017.

Species	Take Activity	Calendar Year				
		2013	2014	2015	2016	2017
American crow	KILL			15		
American kestrel	KILL	0	0	0	0	
American kestrel	TRAP & RELOCATE	0	0			0
American robin	KILL	0	0	0	0	0
American robin	NEST ACTIVE - DESTROY					0
Barn owl	KILL			0	0	
Barn owl	TRAP & RELOCATE	0	0			0
Barn swallow	KILL	0	0	0	0	0
Barn swallow	NEST ACTIVE - DESTROY					0
Black-crowned night heron	KILL	0	0	0	0	0
Barred owl	KILL			0	0	
Barred owl	TRAP & RELOCATE					0
Brown-headed cowbird	KILL		22			
Black vulture	KILL	0	0	0	0	0
Cattle egret	KILL	0	0	0	0	0
Canada goose	KILL	63	49	28	7	5
Chimney swift	KILL	0	0	0	0	0
Chimney swift	NEST ACTIVE - DESTROY					0
Common grackle	KILL			1		
Cooper's hawk	KILL			0		
Cooper's hawk	TRAP & RELOCATE	0	0		3	5
Eagle	HAZED					26
Eastern meadowlark	KILL	5	0	0	2	0
Eastern meadowlark	NEST ACTIVE - DESTROY					0
Great black-backed gull	KILL				0	3
Great blue heron	KILL	1	0	0	0	0
Great horned owl	KILL			0	0	
Great horned owl	TRAP & RELOCATE	0	0			0
Green heron	KILL	0	0	0	0	0
Herring gull	KILL				0	0
Killdeer	KILL	54	15	31	25	6
Killdeer	NEST ACTIVE - DESTROY					0
Laughing gull	KILL	4	2	0	11	0
Mallard	KILL	21	29	15	18	0
Mallard	NEST ACTIVE - DESTROY					0
Mourning dove	KILL	96	35	63	37	58
Mourning dove	NEST ACTIVE - DESTROY					0
Northern harrier	KILL			0	0	
Northern harrier	TRAP & RELOCATE	0	0			0
Ring-billed gull	KILL	18	25	21	19	0
Ring-necked duck	KILL	0	4	0	0	0
Red-shouldered hawk	KILL			0	0	
Red-shouldered hawk	TRAP & RELOCATE	0	0			2
Red-tailed hawk	KILL			0		
Red-tailed hawk	TRAP & RELOCATE	0	0		3	1
Red-winged blackbird	KILL			6		

Species	Take Activity	Calendar Year				
		2013	2014	2015	2016	2017
Sharp-shinned hawk	KILL			0	0	
Sharp-shinned hawk	TRAP & RELOCATE	0	0			0
European starling	KILL		129			
Trumpeter swan	KILL	0	0	0	0	0
Trumpeter swan	NEST ACTIVE - DESTROY					2
Turkey vulture	KILL	2	1	4	2	0
Yellow-crowned night heron	KILL	0	0	0	0	0
Annual Total Take		**264**	**311**	**184**	**127**	**134**

Table 16. Quarterly BASH strikes on JBA Main Base, 2013 – 2017.

Fiscal Year	Strikes per Quarter				Annual Total
	Q1	Q2	Q3	Q4	
2013	0	4	7	23	**34**
2014	11	0	13	20	**44**
2015	18	2	13	19	**52**
2016	8	7	25	15	**55**
2017	8	10	23	43	**84**
2018	13	3	11	21	**48**
Average	**9.7**	**4.3**	**15.3**	**23.5**	**52.8**

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

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

Program Overview/Current Management Practices

JBA's location in Prince George's County, Maryland requires the Base's projects comply with Federal Coastal Zone Management Act of 1972 (CZMA), as amended, and the subsequent Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). Compliance with the CZMA and CZARA mandates that activities within the coastal zone that affects any land or water use or natural resource shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of the federally approved Coastal Zone Management Program (CZMP) for the State of Maryland.

Compliance is achieved by Maryland regulatory review for "Federal consistency" of Base actions. Base actions are: (1) any Base development project and (2) any Base application for a required Federal license or permit to conduct an activity affecting land or water use or natural resource. Examples of a Federal permit or license obtained by JBA include water quality permits for non-point sources, permits for

stormwater associated with construction activities and the permits to impact floodplain and wetlands on Base.

Maryland's CZMP is a coordinated program by state agencies, based on existing laws and authorities, for the protection, preservation, and orderly development of Maryland's coastal resources. Specific goals, objectives, and policies have been developed for the management of uses and activities which have a direct, and potentially significant, effect on coastal resources. Overall management is achieved through the use of existing State of Maryland regulatory programs, State of Maryland Executive Order 01.01.1978.05 mandating the program, and Memoranda of Understanding between appropriate state departments.

MD DNR is the lead agency for the state's CZMP. Within MD DNR, the Coastal Zone Management Division of the Watershed Services Unit is the lead agency for the CZMP. The federal consistency requirements are carried out by the MDE Coastal Zone Consistency Division in the Wetlands and Waterways Program of the Water Management Administration (WMA). The WMA is responsible for coordinating the review with the appropriate state agencies. The "Federal consistency" review can be initiated with direct interaction by JBA and either the MD DNR or MDE or through the Maryland State Clearinghouse operated by the Maryland Department of Planning (MDP). Examples of direct interaction with either MD DNR or MDE are a result of applications for water quality permits for non-point sources, permits for stormwater associated with construction activities and the permits to impact floodplain and wetlands on Base. An example of the Clearinghouse being the initial contact is the NEPA single point of contact in accordance with EO 12372 *Intergovernmental Review of Federal Programs* and the Maryland Code of Regulations.

7.14 Cultural Resources Protection

Applicability Statement

This section applies to AF 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

The region around JBA has a rich cultural heritage. The Piscataway Indian people have lived in southern Maryland for centuries and modern Piscataway members still live on the western shore of the state. Several place names in the region are based on the Algonquin words used by the Piscataway tribes. The Piscataway controlled a territory that stretched from St. Mary's County north to the fall line, and their capital was at Moyaone on Piscataway Creek. Each village or town was ruled by its own leader (Strickland et al., 2015).

Regional archaeological sites dating between 950 and 1700 AD indicate that native tribes built short-term camps that were used as a Base for hunting and gathering expeditions. Some camps were sufficiently large enough to qualify as towns or villages. The native peoples appear to have lived in wigwams or longhouses which were constructed of wood posts covered in reeds. In the Potomac Creek and Accokeek Creek areas, several of these villages were surrounded by wooden palisades (Strickland et al., 2015).

The importance of the watersheds in and around JBA to Native Americans recently led the NPS to identify the Mattawoman and Nanjemoy Creeks watersheds as Indigenous Cultural Landscapes (ICLs). Suitland et al. (2015) describes the known history of Native American uses of these watersheds and the landscape features which attracted and supported them. The Brandywine GSU is located within the Mattawoman Creek watershed.

In Strickland et al. (2015)'s ICL study of the Nanjemoy and Mattawoman Creek watersheds, Cedarville Road and the Cedarville State Forest, with its American Indian Cultural Center, were identified as important cultural locations to the Cedarville Band of the Piscataway. Cedarville Road parallels the southern boundary of the Brandywine GSU, and Cedarville State Forest is located less than 0.50 miles from the southeastern corner of the GSU.

The 1669 Piscataway Indian Reserve created by the State of Maryland was located on the eastern Potomac River shoreline from the Piscataway River mouth south to present-day Potomac Heights, with Mattawoman Creek as its southern and eastern boundary. The Piscataway capital of Moyaons was located on the southwest side of the mouth of the Piscataway Creek at the Potomac River, partially within the present-day federal Piscataway Park and the private development of Moyaone Reserve (Suitland et al., 2015). The headwaters of Piscataway Creek are on the JBA Main Base, which is approximately ten miles northeast of the Piscataway capital Moyaons.

The ICRMP for JBA describes the archaeological and historical resources found at the installation and their management. Belle Chance was an 18th century plantation and its current buildings date from the early 20th century (see Section 2.1.2). The Darcey Family Cemetery is nearby. Belle Chance served as the Base Commander's residence for several decades starting in 1946 (Jamieson and Jefferson, 2001). The house has recently been privatized and is now a residence for NCR General Officers. A preservation covenant was placed on the historical area of the Main Base in 2007 and the IDP places the area in its own Planning District. Other cultural resources on the installation include Chapel II, a 19th century farmstead and rural domestic and school resources from the late 19th to early 20th centuries associated with agricultural villages (JBA, 2014c). To date no structures have been placed on the National Register of Historic Places, although a few sites are eligible under certain criteria. Suitland Parkway, adjacent to the Main Base on the north side, is listed on the National Register.

Belle Chance, the Darcey Family Cemetery, St. Luke's Church Site and Cemetery and Chapel II (Forest Grove Methodist Episcopal Church) are listed as Prince George's County Historic Sites that are locally significant. The history of Chapel II is described in Section 2.1.2. JBA does not treat Chapel II as a historic property due to modifications to the church that have reduced its historical integrity; the chapel has been determined to not be eligible for the National Register (JBA, 2014c).

The installation has a small number of archaeological sites related to Native American use or occupation, primarily related to short-term resource procurement, at both the Main Base and the Davidsonville GSU. Some of the sites pre-date 900 AD. One site includes a shell midden. A few of the prehistoric resources at JBA are impacted by natural resources. Three sites are located along the wooded bluffs overlooking the Patuxent River at the Davidsonville GSU and are threatened by bank erosion. A fourth site has been impacted by a hiking trail and potentially is in need of restoration and stabilization (JBA, 2014c).

JBA continually identifies and reviews buildings and facilities on the installation as they become old enough for potential listing on the National Register of Historic Places. Many of the buildings on the Main Base date to the Cold War era, which now makes a number of them over the minimum age criteria of 50 years.

AFI 90-2002, *Air Force Interactions with Federally-Recognized Tribes,* directs all echelons within the Air Force to build relationships and conduct consultations with federally-recognized Indian/Alaska Native tribes, bands, nations, pueblos, or communities as required by federal laws and regulations, Executive Orders, and Presidential Memoranda. Within Maryland, there are no federally-recognized tribes. If in the future a tribe is federally-recognized within Maryland, JBA will immediately identify if the tribe has any historical or cultural affiliation to our property and if so, will take the necessary steps to implement all necessary protocols and meetings.

Although there are no federally-recognized tribes in Maryland, there are two Piscataway tribes that were recently recognized by the State of Maryland – the Piscataway Indian Nation and the Piscataway Conoy Tribe.

7.15 Public Outreach

Applicability Statement

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

Program Overview/Current Management Practices

The 316th Wing Public Affairs office is responsible for communicating information about the 316th Wing and Base programs and activities to the general public and Air Force members and their families. Their mission is to ensure all audiences are informed about how well the Air Force is prepared to carry out its mission at JBA. The Public Affairs office coordinates guided public tours of the Main Base, available to groups of 10 to 40 people. For safety reasons, children under the age of ten are not allowed.

The 316th Wing Plans and Exercises office plans and executes an Air Expo every two years. This airshow allows the DoD to showcase the military's air and land assets to more than 100,000 spectators each year.

Due to mission and security constraints, no public access is permitted for hunting, fishing, trapping, or other wildlife-related outdoor recreation at JBA Main Base, the Davidsonville Transmitter Station, or the Brandywine Receiver Station. Hunting at the Davidsonville and Brandywine GSUs is limited to members of the Brandywine Bowhunters Club (see Section 7.1).

The primary means of environmental awareness at JBA is the 11 CES/CEIE Office, which coordinates with other entities on the Base, outside regulatory agencies, and the community. In addition, the Outdoor Recreation office is responsible for initiating and implementing outreach for environmental awareness and programs, including nature education and outdoor recreation programs on the Main Base and the GSUs.

The *USAF Pollinator Conservation Reference Guide* (USFWS, 2017) includes a series of public outreach activities and materials that could be used at JBA to increase environmental awareness of the Base community to the threats, needs and recent management activities at JBA for pollinators in need of conservation.

The SWMP (JBA, 2017a) includes distributing brochures, posters, email messages and other materials to work centers and military family housing as a BMP for stormwater management at the installation.

7.16 Geographic Information Systems (GIS)

Applicability Statement

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

Program Overview/Current Management Practices

Complete and usable electronic Geographic Information System (GIS) data and access to GIS software are essential for efficient natural resources management. GIS data allows JBA to organize, evaluate, and present

natural resources information for the Main Base and the two GSUs. In addition, the data facilitates accurate analysis of potential effects of all future projects and activities. JBA has existing GIS data for natural resources, and personnel at JBA have the capability to use GIS onsite through GeoBase, an intranet site. Not all previous natural resources surveys and studies have GIS data available. Digitizing older paper records would enhance the GIS resources of the natural resources management personnel at JBA.

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 AF 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

Management goals and objectives were developed through a thorough evaluation of the natural resources present on JBA. This updated INRMP will be implemented through the various policies and programs described throughout the document.

GOAL 1: MANAGE NATURAL RESOURCES WHILE SUPPORTING MISSION

GOAL 1: Manage natural resources in a manner that is compatible with and supports the military mission while complying with applicable federal and state laws and USAF regulations and policies.

- OBJECTIVE 1.1: Initiate and/or continue programs and projects that enhance mission and training land / opportunities and result in no net loss in mission capability, while complying with all laws, regulations and policies
    - PROJECT 1.1.1. Fill the vacant NRM position.
    - PROJECT 1.1.2. Enroll a Security Forces representative into the Federal Law Enforcement Training Center (FLETC) Land Management Police Training (LMPT) Program and/or enter into a law enforcement agreement with the Maryland Natural Resources Police (MD DNR Law Enforcement) to enforce fish and wildlife laws and regulations at JBA as needed.
    - PROJECT 1.1.3. Conduct a metes and bounds survey and demarcation for encroachment and trespass issues at Davidsonville GSU.

    - PROJECT 1.1.4. Use the UWFWS IPaC online system for self-certification of potential ESA-related impacts for proposed projects. Submit verification letters, as needed, to USFWS.
    - PROJECT 1.1.5. Comply with the MBTA by 1) conducting land clearing activities outside of the bird nesting season, 2) maintaining existing forested corridors, and 3) conducting reforestation initiatives where possible.
    - PROJECT 1.1.6. Maintain active regulatory permits, renewing permits as necessary.
- OBJECTIVE 1.2: Use adaptive, ecosystem management as the primary natural resources management paradigm
    - PROJECT 1.2.1. Prepare an application for the Courses at Andrews to become a member of Audubon International's Cooperative Sanctuary Program for environmental management.
    - PROJECT 1.2.2. Begin to implement the creation of pollinator habitats at ERP sites IAW the *USAF Pollinator Conservation Reference Guide* (e.g., selecting pollinator plant species in remedy design and operations/maintenance).
    - PROJECT 1.2.3. Implement the Arbor Plan, and the associated JBA Environmental Policy, regarding conservation and reforestation of forest habitat at JBA.
- OBJECTIVE 1.3: Use the INRMP Project Team to facilitate implementation of this INRMP and to share knowledge about natural resources management at JBA
    - PROJECT 1.3.1. Make the updated INRMP available to all JBA community members by making a PDF version available online and at the Base library.
    - PROJECT 1.3.2. 11 CES/CEIE Natural Resources personnel will attend at least one DoD-sponsored natural resources training workshop, USFWS National Conservation Training Center course, or a training offering by another Sikes Act partner each year. Examples include: Air Force Environmental Symposium, the National Military Fish and Wildlife Association annual training workshop, and the annual DoD Forestry Workshop and the DoD Conservation Workshop.
    - PROJECT 1.3.3. Digitize and organize the paper records of NR-related materials to fill data gaps in the AFRIMS records management system.
    - PROJECT 1.3.4. Review and comment on proposed Base projects during the EIAP to assist in the avoidance, minimization and mitigation of potential impacts to wetlands, streams, floodplains, forests and other valuable fish and wildlife habitat IAW the INRMP goals and objectives.
    - PROJECT 1.3.5. Continue monitoring soil and geology on-Base to identify drainage and erosion issues before they become an environmental constraint.
    - PROJECT 1.3.6. Review and comment on proposed Base building demolition projects to maximize fish and wildlife value, while minimizing potential BASH issues, of sites which will remain undeveloped.
- OBJECTIVE 1.4: Provide outdoor recreation opportunities that do not conflict with sustainable ecosystem management or the military mission or jeopardize the safety of JBA users
    - PROJECT 1.4.1. Enhance outdoor recreation for natural resources appreciation through enhancement and maintenance of Yuma Trail, nest box programs, fishing at Freedom Lake, and other high-quality natural resources-based recreational opportunities. Evaluate the need for an Outdoor Recreation Plan.
    - PROJECT 1.4.2. Develop public access and recreational use management plans, including the use of off road vehicles (ORVs), for the Brandywine and Davidsonville GSUs; develop

outreach material to neighboring property owners about the public access and recreational uses allowed and prohibited as part of the management plans.

- OBJECTIVE 1.5: Conduct internal environmental awareness activities to minimize impacts to natural resources
    - PROJECT 1.5.1. Purchase or develop training or outreach materials such as pamphlets, presentations, interpretive kiosks, signage, or other media for activities such as Earth Day, P2 Awareness Week, air shows, partnering efforts, and other non-regulatory mandated events or notifications.
    - PROJECT 1.5.2. Provide JBA residents with information for reducing impacts to stormwater drainages, including providing stormwater pollution prevention awareness at military family housing Town Hall meetings.
    - PROJECT 1.5.3. Conduct educational outreach to Base personnel, residents and visitors through programs and/or materials about the plight of pollinators and the pollinator conservation actions taken by the Base in its IPM and pollinator conservation habitat activities (e.g., Monarchs in the Rough, native pollinator food plants in landscaping, honey bee hives).
- OBJECTIVE 1.6: Cooperate with other agencies and local landowners on regional land and natural resources management
    - PROJECT 1.6.1. Update the MOA with the NPS and State of Maryland to adaptively manage vegetative obstructions in the Suitland Parkway management area to address the long-term hazards of encroaching vegetation on the glide slopes.
    - PROJECT 1.6.2. Partner with MD DNR to develop a management plan for RTE species at the Brandywine GSU.
    - PROJECT 1.6.3. Assess whether MD DNR still collects seeds from native grassland plants at Brandywine GSU for use at other grassland restoration projects and determine whether formalizing the informal partnership with an MOA would be appropriate.
    - PROJECT 1.6.4. Monitor the underway relocation of the NuStar pipeline on Base as part of the Maryland State Highway Administration's project to realign the Suitland Parkway - MD 4 interchange at the northeast corner of the Main Base to ensure that the required 0.7 acres of reforestation and 0.3 acres of afforestation mitigation requirements are implemented.
    - PROJECT 1.6.5. Work with Prince George's County to change land use designation of land to the southeast of the airfield from "industrial" to a more compatible use such as "parkland".
    - PROJECT 1.6.6. Pursue land acquisition, easement or partnership with "covenant not to construct" for property adjoining southeast portion of the Main Base to expand the usable capacity of the MSA.

Programmatic management includes INRMP annual reviews, adaptive management, environmental awareness, public outreach, outdoor recreation, GIS data management, and other objectives related to implementing a natural resources management program.

GOAL 2: FISH AND WILDLIFE MANAGEMENT

GOAL 2: Maintain fish and wildlife populations while minimizing potential impacts to the military mission.

- OBJECTIVE 2.1: Manage wildlife using a systematic approach that includes inventory, monitoring, management, and assessment
    - PROJECT 2.1.1. Annually purchase expendable supplies, not equipment, unique to conservation for inventory, monitoring, management and assessment of JBA natural resources.
    - PROJECT 2.1.2. Assess the status and condition of the 21 nest boxes installed in or around 2016 for bats, butterflies, bluebirds, barn owls, mallards and wood ducks; evaluate replacement(s) or relocation(s) as needed if they pose no BASH risk.
    - PROJECT 2.1.3. Conduct a comprehensive fish and wildlife survey of the Main Base, Brandywine GSU and Davidsonville GSU with the objectives to 1) compile a list of species present and their habitat associations; 2) identify the presence / absence of any habitats classified as "Key Habitats" and species classified as "Species in Greatest Conservation Need" (SGCN) by the Maryland State Wildlife Action Plan; and 3) identify the presence / absence of pollinator species petitioned for ESA listing (Yellow-banded bumble bee, Monarch butterfly, Regal fritillary).
- OBJECTIVE 2.2: Minimize BASH risk by deterring birds and other hazardous wildlife from flight line areas
    - PROJECT 2.2.1. Continue to implement the BASH Program in partnership with the USDA/APHIS/WS and others, including the mitigation of bird habitat surrounding the airfield to reduce BASH potential through implementation of measures to reduce wildlife attractants identified in JBAI 91-212.
    - PROJECT 2.2.2. Evaluate the potential BASH impacts from restocking Base Lake with fish.
    - PROJECT 2.2.3. Evaluate whether coyote presence at the GSUs poses a potential BASH risk and develop management response(s) as needed.
    - PROJECT 2.2.4. Locate an approved meat processor to support higher deer depredation rates as part of the BASH Program. Procure contracting services for other carcass disposal.
- OBJECTIVE 2.3: Maintain a sustainable wildlife harvest program using adaptive, ecosystem management
    - PROJECT 2.3.1. Evaluate allowing the Brandywine Bowhunters Club to hunt turkey at the Davidsonville GSU.
    - PROJECT 2.3.2. Enhance the partnership with the Brandywine Bowhunters Club by obtaining an updated copy of their charter, preparing a brief for the club to increase their awareness of environmentally sensitive areas at the GSUs, and if a real estate permit is issued for their use of the GSUs, process an 813.

GOAL 3: THREATENED AND ENDANGERED SPECIES MANAGEMENT

GOAL 3: Manage rare species using an ecosystem approach, while maintaining the military mission at JBA

- OBJECTIVE 3.1: Conduct flora and fauna surveys regularly, particularly where potential habitat exists for threatened and endangered species

  - PROJECT 3.1.1. Annually monitor the sandplain gerardia reserve area on the Main Base. Record presence or absence of the species, its coverage area, the condition of the population, and any stressors. Surveys should be conducted by a recognized expert in identification of the species.
  - PROJECT 3.1.2. Conduct Line Transect Distance Sampling (LTDS) of ~4,900 acres of JBA Main Base, 1,640 acres on the Brandywine GSU, and 864 acres at the Davidsonville GSU to document state and federal RTE, petitioned and SGCN species' population size and density. Assess the need for species management plans for any identified species of high Heritage Status Ranks.
  - PROJECT 3.1.3. Conduct manual bat surveys to identify the species, abundance and distribution occurring on the Main Base, Brandywine GSU and Davidsonville GSU; utilize the results of the acoustic bat survey conducted by TetraTech to develop the survey protocols; identify the presence or absence of the federally-listed Northern long-eared bat.
  - PROJECT 3.1.4. Conduct a vegetation survey to identify the current types, locations and acreages of vegetative communities and ecological units on the Main Base, Brandywine GSU and Davidsonville GSU.
  - PROJECT 3.1.6. Conduct a tree cover survey every three years to maintain current data on the location and extent of forests on-Base; utilize the data in any CZMA Federal Consistency Determinations for consistency with the Maryland Forest Conservation Act to the maximum extent practicable and update the INRMP as needed.
- OBJECTIVE 3.2: Maintain populations of rare flora and fauna species
  - PROJECT 3.2.1. Maintain the 2.3-acre sandplain gerardia management area on the Main Base through removal of encroaching vegetation and replacement of fencing and signs as needed.
  - PROJECT 3.2.2. Install a fourth one-acre Monarchs in the Rough habitat area near Hole W12 as several golf course holes are relocated and redesigned as part of the PAR Complex project. Maintain the existing three one-acre Monarchs in the Rough habitat areas at the golf courses (near holes S4, S15 and E9) as needed for pollinator species, including the monarch butterfly.
  - PROJECT 3.2.3. Install two additional bee hives at the Courses at Andrews; maintain the two existing honey bee hives near the Base Lake at the Courses at Andrews and at least two honey bee hives installed by Pest Management to promote the conservation of honey bees; use the honey produced by the hives at the SmokeHouse 54 restaurant at the Courses at Andrews.
  - PROJECT 3.2.5. Develop a management plan for any federally- or state-listed bat species identified on the Main Base, Brandywine GSU and/or Davidsonville GSU.
  - PROJECT 3.2.6. Develop a management plan, in coordination with MD DNR, for any identified Key Habitats or SGCN on the Main Base, Brandywine GSU or Davidsonville GSU.

GOAL 4: VEGETATION MANAGEMENT

GOAL 4: Manage vegetation using sustainable and cost-effective methods without negatively impacting the mission

- OBJECTIVE 4.1: Maintain intact, healthy habitat and enhance or restore degraded habitat, without increasing BASH risk
    - PROJECT 4.1.1. Improve wildlife forest habitat by removing trash and other debris and improving ecosystem health through forest improvements. Forested areas at JBA have been neglected and become a repository for trash and debris. The current state of these limited natural areas on Base is poor and does not reflect the AF commitment to maintaining quality wildlife habitat.
    - PROJECT 4.1.2. Identify areas on the Main Base and two GSUs for pollinator conservation and develop and implement management practices in accordance with the *USAF Pollinator Conservation Reference Guide*.
    - PROJECT 4.1.3. Update the 2011 Arbor Plan and include tree and ground maintenance activities and both GSUs. Evaluate a requirement for planting only native species in forested areas.
- OBJECTIVE 4.2: Maximize native plants and avoid invasive non-native plants in landscaping and re-vegetation projects
    - PROJECT 4.2.1. Conduct a turf and landscaped areas survey to identify the current predominant species of turf grass, ground cover, and tree and shrub species in developed areas of the installation. Require native turf species for new development projects.
- OBJECTIVE 4.3: Minimize chemical and maintenance input during grounds maintenance
    - PROJECT 4.3.1. Continue to include conditions in the grounds maintenance service contract that minimize the use of chemicals.
    - PROJECT 4.3.2. Continue to categorize the Main Base into three zones in the grounds maintenance service contract (i.e., improved, semi-improved, unimproved) to minimize the maintenance requirements and habitat disturbance wherever practical.
    - PROJECT 4.3.3. Maintain a current IPMP to minimize the use of chemical treatments in grounds maintenance.

Vegetation management includes forest management, fish and wildlife habitat management, rare species management, and grounds maintenance. There is a significant overlap in the objectives within this section and all other sections within the INRMP, which is indicative of the essential role vegetation plays in ecosystems and natural resources management.

GOAL 5: INVASIVE AND PEST SPECIES

GOAL 5: Minimize impacts of invasive and pest species, while minimizing use of chemicals to manage those species, using an integrated management approach.

- OBJECTIVE 5.1: Control and minimize the impact of invasive species to reduce competition with native species
    - PROJECT 5.1.1. Remove invasive species at JBA. Invasive species include: Japanese honeysuckle, common reed (Phragmites), trumpet creeper, multiflora rose, and garlic mustard. Allowing the invasive species to spread will cause the loss of native species that are rare in the state and reduce biological diversity and habitat value.
    - PROJECT 5.1.2. Conduct invasive species control of common reed (Phragmites), including outreach and education to grounds maintenance personnel on appropriate

spraying and mowing schedules and areas that impact the control of invasive species on Base.

- OBJECTIVE 5.2: Maintain accurate data about current distribution of invasive species and effects of treatments
    - PROJECT 5.2.1. Conduct an invasive species survey of the Main Base, Brandywine GSU and Davidsonville GSU to maintain current data on the species, abundance and distribution of invasive species and monitor the effectiveness of invasive species control treatments.
- OBJECTIVE 5.3: Protect infrastructure from pest species
    - PROJECT 5.3.1. Continue to implement the IPMP through daily, weekly, monthly and annual inspections and surveys for pests.
    - PROJECT 5.3.2. Apply non-chemical and chemical treatments as needed to protect infrastructure from pest species, in accordance with the current IPMP.
- OBJECTIVE 5.4: Create and Implement IPMP
    - PROJECT 5.4.1. Update the IPMP as needed.
    - PROJECT 5.4.2. Conduct annual reviews of the IPMP.

GOAL 6: WATER RESOURCES MANAGEMENT

GOAL 6: Protect water resources and minimize impacts to coastal resources consistent with state and federal laws pertaining to water resources

- OBJECTIVE 6.1: Manage wetland areas to minimize impacts to existing wetlands and minimize the potential for new wetlands due to BASH risk
    - PROJECT 6.1.1. Utilize the UMBI with the USACE and other partners to address current and planned future deficits for wetlands mitigation, including the use of wetland and stream mitigation credits at the Mattawoman Creek Mitigation Site for the PAR Project.
    - PROJECT 6.1.2. Maintain a 25-foot buffer around delineated wetlands.
    - PROJECT 6.1.3. Manage, restore and/or enhance wetland habitats IAW the terms and conditions of permits issued under Section 404 of the Clean Water Act.
- OBJECTIVE 6.2: Maintain accurate and complete data associated with water resources to facilitate impact assessment and permitting, when needed
    - PROJECT 6.2.1. Update wetland delineation(s) and jurisdictional determination(s) for wetlands on-Base as they expire to maintain current data on the location and extent of wetlands and waters of the U.S.; a 2014 JD for 44.4 acres of wetlands inside Pathfinder will expire in 2019.
    - PROJECT 6.2.2. Delineate jurisdictional wetlands and obtain jurisdictional determination(s) for wetlands on-Base but outside of the airfield security fence; a wetland delineation was completed in 2013 but no JD was ever issued.
    - PROJECT 6.2.3. Conduct a base-wide floodplain analysis for the Main Base and Brandywine and Davidsonville GSUs, updating and finalizing the 2004 draft analysis.
- OBJECTIVE 6.3: Minimize nonpoint source pollution through implementation of BMPs and following existing spill prevention and hazardous materials management protocols
    - PROJECT 6.3.1. Implement the Best Management Practices (BMPs) in the 2017 JBA Stormwater Management Plan.
    - PROJECT 6.3.2. Conduct annual base-wide cleanup days in the spring.

- OBJECTIVE 6.4: Maintain healthy riparian buffer zones to protect surface waters
    - PROJECT 6.4.1. Site future development projects outside of the 100-year floodplain whenever possible.
- OBJECTIVE 6.5: Manage soil to minimize sediment loss and erosion, while protecting water quality
    - PROJECT 6.5.1. Continue to comply with all sediment and erosion control permits and regulations for Base development projects.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

The 11 CES/CEIE personnel will coordinate and implement the INRMP, with support from the 11 WG's Engineering, Programming and Design; Operations; and Community Services staff. The 89 WG Flight Safety and 79 WG Bioenvironmental Engineer will also provide support. JBA is currently authorized a full-time Biological Scientist (GS-0401-12) to develop, implement, and enforce the INRMP and to manage the installation's natural resources. The Natural Resources Manager position is classified as inter-disciplinary (0401/13910819) and was filled by a full-time Environmental Engineer (GS-0819-12) for most of FY2018. From 12 June through 30 September 2018, the position was filled by a full-time Environmental Scientist (GS-1301-12).

Additional labor resources may include:

- Federal agencies;
- State agencies;
- Local and regional universities;
- Scouting groups; and
- Conservation groups (e.g., Audubon Society, and sportsmen's clubs)

The primary measure of INRMP effectiveness is whether implementation of the INRMP helps prevent net loss in the capability of military lands to support the military mission. The 11 CES/CEIE is preserving JBA's capability to support the mission through its natural resource management practices outlined in the 2014 INRMP and in this update.

Long-term management effectiveness is also evaluated through periodic inventories of species populations, habitat quantity and quality, and habitat values through recurring Planning Level Surveys (PLS). Trends can be used to indicate the degree of success. The 11 CES/CEIE will evaluate these recurring data as they become available.

A practical evaluation of INRMP implementation includes reviewing whether planned projects and activities have been accomplished. The INRMP Annual Reviews, conducted by the NRM, assess the implementation status of projects annually. A large number of the projects are recurring actions that are continued in this INRMP.

In accordance with AFI 32-7064, an INRMP is considered implemented if an installation:

- Actively requests, receives, and uses funds for priority projects and activities (Levels 0 and 1 as defined by AFI 32-7001 Environmental Management and DoDI 4715.03);
- Executes all priority projects and activities in accordance with specific timeframes identified in the INRMP;
- Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP;
- Reviews the INRMP annually and coordinates annually with cooperating agencies; and
- Documents specific INRMP action accomplishments undertaken each year.

9.2 Monitoring INRMP Implementation

Monitoring of INRMP implementation is necessary to facilitate the legal requirements of the SAIA for review for operation and effect. The SAIA implementation criteria do not necessarily measure the effectiveness of an INRMP in facilitating mission accomplishment while conserving natural resources. The JBA INRMP implementation will be monitored for meeting the legal requirements of the SAIA as well as for other mission and biological measures of effectiveness.

The ultimate successful implementation of this INRMP is realized in no net loss in the capability of the JBA lands to support the military mission while at the same time providing effective natural resources management. Initiation of projects is one measure that is used to monitor INRMP implementation, but a significant portion of INRMP implementation is done through internal coordination in regard to site operations and land use decision making. This type of implementation cannot be measured by project implementation or funding levels. It is evidenced by such things as the ability to continually train, sustainable land use, ongoing regulatory compliance, retention of species diversity, retention of surface water quality, and the acknowledgement of sustainable natural resources management by partnering conservation agencies and other interested organizations and individuals.

In order to monitor and evaluate the effectiveness of the INRMP implementation the following will be reviewed as applicable and discussed within the context of the annual review and/or a formal review of operation and effect:

- Impacts to/from the military mission;
- Conservation program budget;
- Staff requirements;
- Program and project implementation;
- Trends in species and habitat diversity as evidenced by recurring biological surveys,
- land use changes, and opinions of natural resource experts;
- Compliance with regulatory requirements; and
- Feedback from military trainers, the USFWS, the MD DNR, and others.

Some of these areas may not be looked at every year due to lack of data or pertinent information. The effectiveness of the INRMP as a mission enabling conservation tool will be decided by mutual agreement of the USFWS, the MD DNR, and the 11 CES/CEIE during annual reviews and / or reviews for operation and effect.

The USAF uses the Defense Environmental Programs Annual Report to Congress (DEPARC) to monitor SAIA compliance. DEPARC is the automated system used to collect installation environmental information for reporting to DoD and Congress.

Established to fulfill an annual requirement to report the status of DoD's Environmental Quality program to Congress, DEPARC collects information on enforcement actions, inspections and other performance measures for high-level reports and quarterly reviews. DEPARC also helps the USAF track fulfillment of DoD Measures of Merit requirements.

The DUSD Updated Guidance for Implementation of the SAIA updated Conservation Metrics for Preparing and Implementing INRMPs. Progress toward meeting these measures of merit is reported in the annual report to Congress. DEPARC reporting requirements currently include:

- What are the installation plans, programs and budgets for actions that support INRMP goals and objectives?
- Was the INRMP "fully-implemented" during previous execution year?
- Were all funds allocated for INRMP implementation (EQ, Reimbursable, and other) executed for the intended purpose?
- Is there adequate participation / collaboration from USFWS during Annual INRMP Review and major revisions?
- Is there adequate participation / collaboration from the State Fish and Wildlife Agency during Annual INRMP Review and major revisions?
- Is the INRMP consistent with the goals of the State Wildlife Action Plan (WAP), Candidate Conservation Agreements, and other regional ecosystem management agreements for which DoD/AF is signatory?
- Are communications with USFWS and State Fish and Wildlife Agency documented?
- Does the installation have on-site Air Force natural resources management staff employed in the GS-0400 Biological Sciences Job Series?
- Is there a sufficient number of natural resources staff to adequately implement INRMP goals and objectives?
- Are the capabilities of the Air Force natural resources team enhanced through use of volunteers, cooperative agreements with non-governmental organizations, on-site contractor support, or Interagency Agreements with other federal or state agencies?
- Does the installation have adequate conservation law enforcement capability through employment of a credentialed conservation law enforcement officer, or through interagency agreement with another agency?
- Is there adequate participation/collaboration from the Operations Group, Range and Airspace managers, Community Planners, Tenant Organizations and other organizations in INRMP update and revision to ensure mission needs are addressed?
- Does the INRMP support unrestricted use of the installation?
- Has there been a net loss of operations area, airspace, or training lands? Is there a deficiency in capacity, size, or arrangement of the installation natural infrastructure to support the current mission and foreseeable future needs?

- What are the federally listed threatened and endangered species present on the installation?
- What are the state protected species present on the installation?
- Have surveys for the presence of potentially-occurring, federally-listed Threatened or Endangered species, or suitable habitat within the historic range of a listed species, been conducted on the installation?
- Does the INRMP adequately address potentially-occurring Threatened or Endangered species and/or potentially-suitable habitat within the historic range of a listed species?
- Have Threatened or Endangered species locations or potentially-suitable habitats within the historic range of a listed species, been mapped and included as part of the Environmental Functional Data Set and Geodatabase?
- Does the INRMP provide adequate conservation measures for identified Threatened or Endangered species and their habitat, as mutually-agreed by USFWS and State Fish and Wildlife agency during the INRMP Annual Review or major revision coordination?
- Has Critical Habitat for Threatened or Endangered species been designated on the installation?
- Have all major ecosystems (i.e., vegetative communities / habitats) been surveyed and mapped for the installation?
- Does the INRMP address the desired future condition for ecosystems, habitats and communities to sustain current and future mission activities and achieve natural resources management goals and objectives?
- Are native habitat restoration projects to support INRMP goals and objectives being planned, programmed, budgeted and executed?
- Does the INRMP provide for adequate control of invasive and exotic species?
- Does the INRMP address the availability of outdoor recreational opportunities (e.g., hunting, fishing, and other dispersed outdoor recreation) on the installation?
- Does the INRMP address the availability of outdoor recreation opportunities for the public, and establish access and usage categories for installation areas in accordance with mission and security requirements (i.e., Open, Restricted, Off-Limits)?
- For each outdoor recreation access category (Open, Restricted, Off-Limits), does the INRMP address and justify allowable access to those areas by category of participant (e.g., Active Duty Military, Military Dependents, DoD Civilians, Military Retirees, Defense Contractors, General Public)?
- Does the INRMP address program management for hunting, fishing and other outdoor recreation, and the role of the installation natural resources manager?

9.3 Annual INRMP Review and Update Requirements

Per DoD policy, the 11 CES/CEIE will review the INRMP annually in cooperation with the USFWS and MD DNR. On an annual basis, the 11 CES/CEIE will invite the USFWS Regional Office, the USFWS local Field Office, and the MD DNR to participate in a conference call or attend a meeting to review previous year INRMP implementation and discuss implementation of upcoming programs and projects. Invitations will be either by email or letter. Attendance is at the option of those invited, but, at minimum, the USFWS

local field office and one representative of MD DNR are expected to attend. The meeting will be documented with an agenda, meeting minutes and sign-in roster of attendees.

At this annual meeting the attendees will discuss the need for updates or revisions. If updates are needed, the requesting party will initiate the updates and, after agreement of all three parties, they will be added to the INRMP. If it is determined that revision is needed, all three parties will provide input and an INRMP revision will be initiated with the 11 CES/CEIE acting as the lead coordinating agency. The annual meeting will be used to help expedite the more formal review for operation and effect and if all parties agree and document their mutual agreement, it can fulfill the requirement to review the INRMP for operation and effect.

If not already determined in previous annual meetings, by the fourth year annual review a determination will be made jointly to continue implementation of the existing INRMP with updates or alternatively to proceed with a revision. If the parties feel that the annual reviews have not been sufficient to evaluate operation and effect and if it cannot be determined whether the INRMP implementation should continue or the INRMP be revised, a formal review for operation and effect will be initiated. The determination on how to proceed with INRMP implementation or revision will be made after the parties have had time to complete this review.

As part of the annual review, the 11 CES/CEIE will specifically:

- Invite feedback from the USFWS and MD DNR on the effectiveness of the INRMP;
- Inform the USFWS and MD DNR which INRMP projects and activities are required to meet current natural resources compliance needs; and
- Document specific INRMP action accomplishments from the previous year.

Information for the annual reviews comes from the 11 CES/CEIE and military leadership, cooperating agencies, and project files. Natural resources data and program and project information are available to cooperating agencies. These agencies may request to see project folders or to have a site visit to view natural resources projects in progress at any time.

Not less than every five years, the INRMP will be reviewed for operation and effect to determine if, as required by the SAIA, the INRMP is being implemented and is contributing to the management of natural resources at JBA. The review will be conducted by the three cooperating parties to include the Wing Commander responsible for the INRMP, the Regional Director or Supervisor of the Chesapeake Bay Field Office for the USFWS, and the Senior Review Manager for the MD DNR. While these are the responsible parties, technical personnel generally conduct the review.
The review for operation and effect will either conclude that the INRMP is meeting the intent of the SAIA and it can be updated and implementation can continue; or that it is not effective in meeting the intent of the SAIA to conserve natural resources while providing for no net loss in mission capability and it must be revised. The conclusion of the review will be documented in a jointly executed memorandum, meeting minutes, or in some other way that reflects mutual agreement.

If only updates are needed, they will be done in a manner agreed to by all parties. The updated INRMP will be reviewed by a local Supervisor for the Chesapeake Bay Field Office (USFWS), and the Senior Review Manager for the MD DNR. Once concurrence letters or signatures are received from USFWS Field Office and the MD DNR, the update of the INRMP will be complete and implementation will continue.

If a review of operation and effect concludes that an INRMP must be revised, there is no set time to complete the revision. The existing INRMP remains in effect until the revision is complete and USFWS and MD DNR concurrence on the revised INRMP is received. The 11 CES/CEIE will endeavor to complete such revisions within 18 months depending upon funding availability. Revisions to the INRMP will go through a more detailed review process similar to development of the initial INRMP to ensure JBA military mission, USFWS, and MD DNR concerns are adequately addressed and the plan meets the intent of the SAIA.

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 AF 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 Air Force 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 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 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not be implemented if not accomplished within 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 support long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

The projects needed to implement the goals and objectives of this INRMP, as described in Section 8.0, have been prioritized IAW the priority rankings above. Projects to implement the INRMP over the next five fiscal years are presented in Tables 17 and 18. Table 17 lists projects that recur annually and are applicable to all five fiscal years. Table 18 lists projects that do not recur annually. See Section 8.0 for a full description of each project and which goal and objective the project meets.

Table 17. Recurring annual work plans to implement the INRMP for Fiscal Years 2019-2023.

Annual Work Plans	OPR	Funding Source	Priority Level
PROJECT 1.1.4. Use the UWFWS IPaC online system for self-certification of potential ESA-related impacts for proposed projects. Submit verification letters, as needed, to USFWS	11 CES/CEIE	None required	High
PROJECT 1.1.5. Comply with the MBTA by 1) conducting land clearing activities outside of the bird nesting season, 2) maintaining existing forested corridors, and 3) conducting reforestation initiatives where possible.	11 CES/CEIE, 11 CONS	None required	High
PROJECT 1.1.6. Maintain active regulatory permits, renewing permits as necessary.	11 CES/CEIE	None required	High
PROJECT 1.2.2. Begin to implement the creation of pollinator habitats at ERP sites IAW the *USAF Pollinator Conservation Reference Guide*.	11 CES/CEIE, AFCEC/CZO	AFCEC	Medium
PROJECT 1.2.3. Implement the Arbor Plan, and the associated JBA Environmental Policy, regarding conservation and reforestation of forest habitat at JBA.	11 CES/CEIE	11 CES, AFCEC	Medium
PROJECT 1.3.2. 11 CES/CEIE Natural Resources personnel will attend at least one DoD-sponsored natural resources training workshop or a training offering by another Sikes Act partner each year.	11 CES/CEIE	AFCEC / Training	High
PROJECT 1.3.4. Review and comment on proposed Base projects during the EIAP to assist in the avoidance, minimization and mitigation of potential impacts to wetlands, streams, floodplains, forests and other valuable fish and wildlife habitat.	11 CES/CEIE	None Required	High
PROJECT 1.3.5. Continue monitoring soil and geology on-Base to identify drainage and erosion issues before they become an environmental constraint.	11 CES/CEIE, 11 CES/CEO	None required	High
PROJECT 1.3.6. Review and comment on proposed Base building demolition projects to maximize fish and wildlife value, while minimizing potential BASH issues, of sites which will remain undeveloped.	11 CES/CEIE	None required	High
PROJECT 1.5.1. Purchase or develop training or outreach materials.	11 CES/CEIE	AFCEC / GPC	High
PROJECT 1.5.2. Provide JBA residents with information to reduce impacts to stormwater drainages.	11 CES/CEIE	None required	High

Annual Work Plans	OPR	Funding Source	Priority Level
PROJECT 2.1.1. Purchase expendable supplies, not equipment, unique to natural resources conservation.	11 CES/CEIE	AFCEC / GPC	High
PROJECT 2.2.1. Continue to implement the BASH Program in partnership with the USDA/APHIS/WS and others, including the mitigation of bird habitat surrounding the airfield to reduce BASH potential through implementation of measures to reduce wildlife attractants identified in JBAI 91-212.	11 CES/CEIE, 11 CES/CEOIE, 11 WG/SE	None required	High
PROJECT 3.1.1. Conduct annual monitoring of the sandplain gerardia reserve area.	11 CES/CEIE	AFCEC / GPC	High
PROJECT 3.2.1. Maintain the 2.3-acre sandplain gerardia reserve area through removal of encroaching vegetation and replacement of fencing and signs as needed.	11 CES/CEIE	AFCEC / GPC	High
PROJECT 4.1.1. Remove trash and debris from forested areas to improve ecosystem health.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 4.3.1. Continue to include conditions in the grounds maintenance service contract to minimize the use of chemicals.	11 CES	None required	Medium
PROJECT 4.3.2. Continue to categorize the grounds maintenance service contract areas to minimize habitat disturbance wherever possible.	11 CES	None required	Medium
PROJECT 4.3.3. Maintain a current IPMP to minimize the use of chemical treatments in grounds maintenance.	11 CES	None required	High
PROJECT 5.1.1. Remove invasive species on Base.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 5.3.1. Continue to implement the IPMP through regular pest inspections and surveys.	11 CES	None required	High
PROJECT 5.3.2. Apply non-chemical and chemical treatments as needed to protect infrastructure from pests.	11 CES	None required	High
PROJECT 5.4.1. Update the IPMP as needed.	11 CES	None required	High
PROJECT 5.4.2. Conduct Annual Reviews of the IPMP.	11 CES	None required	High
PROJECT 6.1.2. Maintain a 25-foot buffer around wetlands.	11 CES	None required	High
PROJECT 6.3.1. Implement the BMPs in the 2017 SWMP.	11 CES	11 CES	High
PROJECT 6.3.2. Conduct annual base-wide clean-up days in the spring.	11 CES/CEIE	None required	High

Annual Work Plans	OPR	Funding Source	Priority Level
PROJECT 6.4.1. Site future development projects outside of the 100-year floodplain wherever possible.	11 CES	None required	High
PROJECT 6.5.1. Continue to comply with sediment and erosion control permits and regulations.	11 CES	None required	High

Table 18. Annual work plans to implement the INRMP for Fiscal Years 2019-2023.

Annual Work Plans	OPR	Funding Source	Priority Level
FY2019			
PROJECT 1.1.1 Fill the vacant NRM position.	11 CES/CEIE	N/A	High
PROJECT 1.3.1. Make the updated INRMP available to all JBA community members.	11 CES/CEIE	Not required	High
PROJECT 1.6.1. Update the MOA with the NPS and Maryland to adaptively manage vegetative obstructions in the Suitland Parkway management area to address the long-term hazards of encroaching vegetation on the glide slopes.	11 CES/CENP	11 CES	Medium
PROJECT 1.6.3. Assess whether MD DNR still collects seeds from native grassland plants at Brandywine GSU and whether an MOA is appropriate.	11 CES/CEIE	None required	High
PROJECT 1.6.5. Work with Prince George's County to change land use designation southeast of the airfield from "industrial" to a more compatible use like "parkland."	11 CES/CENP	11 CES	Medium
PROJECT 2.2.2. Evaluate the potential BASH impacts from restocking Base Lake with fish.	11 CES/CEIE, USDA, BASH Team	None required	Medium
PROJECT 2.2.4. Locate an approved meat processor to support high deer depredation rates as part of the BASH Program and procure contracting services for other carcass disposal.	11 CES/CEIE, BASH Team, 11 CES/CEOIE	11 CES	High
PROJECT 2.3.1. Evaluate allowing the Brandywine Bowhunters Club to allow turkey hunting at the Davidsonville GSU.	11 FSS	None required	High
PROJECT 2.3.2. Enhance the partnership with the Brandywine Bowhunters Club.	11 FSS	None required	High
PROJECT 3.1.2. Conduct an LTDS to document RTE, petitioned and SGCN species on the Main Base and both GSUs.	11 CES/CEIE	AFCEC / Contract	High

Annual Work Plans	OPR	Funding Source	Priority Level
FY2020			
PROJECT 1.1.2. Enroll a Security Forces representative into the FLETC LMPT and/or enter into a law enforcement agreement with Maryland Natural Resources Police.	11 SFS	AFCEC / Training	High
PROJECT 2.1.2. Assess the status and condition of nest boxes and replace / relocate as needed if they pose no BASH risk.	11 CES/CEIE	None / NRM	High
PROJECT 2.1.3. Conduct a comprehensive fish and wildlife survey of the Main Base and both GSUs.	11 CES/CEIE, MD DNR	AFCEC / Contract	High
PROJECT 2.2.3. Evaluate whether coyote presence at GSUs poses a potential BASH risk and develop management response(s) as needed.	11 CES/CEIE	None / NRM	High
PROJECT 3.1.3. Conduct manual bat surveys to identify the species, abundance and distribution of bats on the Main Base and both GSUs. Identify the presence or absence of the threatened Northern long-eared bat.	11 CES/CEIE, MD DNR	AFCEC / Contract	High
PROJECT 3.2.3. Install two additional bee hives at the Courses at Andrews. Maintain the existing four bee hives on Base.	11 FSS, 11 CES/CEOIE, 11CES/CEIE	NAF	High
PROJECT 3.2.6. Develop a management plan with MD DNR for any identified key habitats or SGCN on the Main Base and two GSUs.	11 CES/CEIE, MD DNR	AFCEC / Contract	Medium
PROJECT 4.1.2. Identify areas on the Main Base and two GSUs for pollinator conservation. Develop and implement management practices IAW the *USAF Pollinator Conservation Reference Guide*.	11 CES/CEIE	None / NRM	Medium
PROJECT 6.1.1. Purchase wetland and stream compensatory mitigation credits at the MCMS for the PAR project. Utilize the UMBI for planned future wetland and stream impacts.	AFDW	AFDW	High
PROJECT 6.2.1. Update wetland delineation(s) and jurisdictional determination(s) for wetland on-Base as they expire to maintain current data on the location and extent of wetlands and WUS on Base.	11 CES/CEIE	11 CES	High
PROJECT 6.2.2. Delineate jurisdictional wetlands and obtain jurisdictional determination(s) for wetlands on-Base but outside the airfield security fence.	11 CES/CEIE	11 CES	High
PROJECT 6.2.3. Conduct a basewide floodplain analysis for the Main Base and both GSUs.	11 CES/CEIE	11 CES	High

Annual Work Plans	OPR	Funding Source	Priority Level
FY2021			
PROJECT 1.1.3. Conduct a metes and bounds survey and demarcation for encroachment and trespass issues at Davidsonville GSU.	11 CES/CEIAP	11 CES	High
PROJECT 1.3.3. Digitize and organize the paper records of NR-related materials to fill data gaps in the AFRIMS records management system.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 1.4.2. Develop public access and recreational use management plans for the GSUs. Develop outreach materials to neighboring property owners about access and allowed and prohibited uses.	11 CES/CEI	11 CES	Medium
PROJECT 1.5.3. Conduct educational outreach through programs and/or materials about the plight of pollinators and pollinator conservation activities taken by the Base.	11 CES/CEIE	None / NRM	Medium
PROJECT 3.2.2. Install a fourth Monarchs in the Rough habitat area at the golf courses. Maintain the three existing pollinator habitat areas.	11 FSS	NAF	High
PROJECT 3.2.5. Develop a management plan for any T&E bat species identified at the Main Base or GSUs.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 4.1.3. Update the 2011 Arbor Plan and include tree and ground maintenance activities and the GSUs.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 6.1.3. Manage, restore and/or enhance wetland habitats IAW the INRMP and terms and conditions of CWA permits.	11 CES/CEIE	AFCEC / Contract	High
FY2022			
PROJECT 1.2.1. Prepare an application for the Courses at Andrews to become a member of Audubon International's Cooperative Sanctuary Program for environmental management.	11 FSS	NAF	High
PROJECT 1.6.4. Monitor the underway relocation of the NuStar pipeline to ensure reforestation and afforestation mitigation requirements are implemented on Base.	11 CES/CEIE	None required	High
PROJECT 1.6.6. Pursue land acquisition, easement or partnership with "covenant not to construct" for property adjoining the southeast portion of the Main Base to expand the usable capacity of the MSA.	11 CES/CENP	None required	High

Annual Work Plans	OPR	Funding Source	Priority Level
PROJECT 3.1.6. Conduct a tree cover survey every three years to maintain current data on forest resources.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 6.1.3. Manage, restore and/or enhance wetland habitats IAW the INRMP and terms and conditions of CWA permits.	11 CES/CEIE	AFCEC / Contract	High
FY2023			
PROJECT 1.4.1. Enhance outdoor recreation opportunities for natural resources appreciation. Evaluate the need for an Outdoor Recreation Plan.	11 CES/CEIE	AFCEC / GPC, AFCEC / Contract	High
PROJECT 1.6.2. Partner with MD DNR to develop a management plan for RTE at Brandywine GSU.	11 CES/CEIE, MD DNR	None required	Medium
PROJECT 3.1.4. Conduct a vegetation survey to identify the current types, locations and acreages of vegetative communities and ecological units on the Main Base and both GSUs.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 4.2.1. Conduct a turf and landscaped areas survey to identify the current predominant species of turf grass, ground cover, and tree and shrub species in developed areas. Require native turf species in future development projects.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 5.1.2. Conduct invasive species control of Phragmites, including outreach and education to grounds maintenance personnel.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 5.2.1. Conduct an invasive species survey of the Main Base and both GSUs to maintain current data on the species, abundance and distribution of invasive species and monitor the effectiveness of invasive species control treatments.	11 CES/CEIE	AFCEC / Contract	High
PROJECT 6.1.3. Manage, restore and/or enhance wetland habitats IAW the INRMP and terms and conditions of CWA permits.	11 CES/CEIE	AFCEC / Contract	High

11.0 REFERENCES

11.1 ***Standard References*** *(Applicable to all AF installations)*

- AFI 32-7064, *Integrated Natural Resources Management*
- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook – a Internal AF reference available at https://cs1.eis.af.mil/sites/ceportal/CEPlaybooks/NRM2/Pages/

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12.0 ACRONYMS

12.1 ***Standard Acronyms*** *(Applicable to all AF installations)*

- eDASH Acronym Library
- Natural Resources Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

12.2 ***Installation Acronyms***

11 CES/CC	Civil Engineer Squadron Commander
316 CES/CEIE	316th Civil Engineer Squadron / Civil, Environmental and Infrastructure Engineering
11 CES/CEOES	316th Civil Engineer Squadron / Operations Engineering Element
11 MSG/CC	Mission Support Group Commander
11 SFS	Security Forces Squadron
316WG	316th Wing
89 AW	89th Airlift Wing
AEF	Air and Space Expeditionary Force
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AFDW	Air Force District of Washington
AFI	Air Force Instruction
AMC	Air Mobility Command
AMSL	Above Mean Sea Level
ANGRC	Air National Guard Readiness Center
BASH	Bird/Wildlife Aircraft Strike Hazard
BGS	Below Ground Surface
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations

COMAR	Code of Maryland Regulations
CWA	Clean Water Act
CY	Calendar Year
CZARA	Coastal Zone Act Reauthorization
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DCANG	District of Columbia Air National Guard
DEPARC	Defense Environmental Programs Annual Report to Congress
DoD	Department of Defense
DoDI	DoD Instruction
DRMO	Defense Reutilization and Marketing Office
DUSD	Deputy Under Secretary of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Assessment
EISA	Energy Independence and Security Act of 2007
EMS	Environmental Management System
EO	Executive Order
EPA	Environmental Protection Agency
EPF	Environmental Planning Function
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FONSI	Finding of No Significant Impact
FY	Fiscal Year

GEM	Golf Courses Environmental Management
GHG	Greenhouse Gases
GIS	Geographic Information System
GPD	Gallons Per Day
GSU	Geographically Separated Unit
HAZMAT	Hazardous Materials
HUC	Hydrologic Unit Code
ICL	Indigenous Cultural Landscape
IDP	Installation Development Plan
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
ISO	International Standards Organization
JBA	Joint Base Andrews, *also* Joint Base Andrews – Naval Air Facility Washington
JBAI	Joint Base Andrews Instruction
JSOH	Joint Services Open House
LEED	Leadership in Energy and Environmental Design
LF	Landfill
LID	Low Impact Development
MBTA	Migratory Bird Treaty Act
MD	Maryland
MD DNR	Maryland Department of Natural Resources
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
MFS	Maryland Forest Service
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MWR	Morale, Welfare and Recreation

NAF	Non-Appropriated Funds
NAFW	Naval Air Facility Washington
NCR	National Capital Region
NDCEE	National Defense Center for Energy and the Environment
NEEF	National Environmental Education Foundation
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NPDES	National Pollutant Discharge Elimination System
NPLD	National Public Lands Day
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OPR	Office of Primary Responsibility
PAH	Polycyclic Aromatic Hydrocarbon
PLS	Planning Level Survey
POL	Petroleum, Oil and Lubricants
QOL	Quality of Life
REC	Regional Environmental Coordinator
ROD	Record of Decision
SAIA	Sikes Act Improvement Act
SAM	Special Airlift Mission
SDD	Sustainable Design and Development
SFS	Security Forces Squadron
SWPPP	Stormwater Pollution Prevention Plan
TCE	Trichloroethylene
T&E	Threatened and Endangered
TERPS	United States Standard for Terminal Instrument Procedures
UFC	United Facility Code
US	United States
USACE	United States Army Corps of Engineers

USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMA	Water Management Administration
WSSC	Washington Suburban Sanitary Commission
WUS	Waters of the United States

13.0 DEFINITIONS

13.1 Standard Definitions *(Applicable to all AF installations)*

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

- Note that in Appendix A below that AFPD 32-70 was revised and renamed on 30 July 2018. The new title is *Environmental Considerations in Air Force Programs and Activities*.

14.0 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, Protection and Enhancement of Environmental Quality	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, Protection and Enhancement of the Cultural Environment	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, Exotic Organisms	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, Floodplain Management	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, Off-Road vehicles on Public Lands	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, Protection of Wetlands	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize 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, Federal Compliance With Pollution Control Standards	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (US EPA) authority to conduct

Federal Public Laws and Executive Orders	
	reviews and inspections to monitor Federal facility compliance with pollution control standards.
EO 12898, Environmental Justice	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, Exotic and Invasive Species	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	The U.S. Fish and Wildlife Service (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

Federal Public Laws and Executive Orders	
	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 certifiedapplicators.
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.
National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 U.S.C. § 4321 et seq.	Requires Federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act [40 Code of

Federal Public Laws and Executive Orders	
	Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 16 U.S.C. § 470 et seq.	Requires Federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 U.S.C. § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a Federal Permit. Installations should coordinate with the U.S. Army Corps of Engineers (USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System (NPDES) and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 U.S.C. § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forestresources.
Soil and Water Conservation Act (16 U.S.C. § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other Federal and local programs.
Sikes Act (16 U.S.C. § 670a–670l, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the 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 Integrated Natural Resources Management Plan and public access to natural resources, and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources

Federal Public Laws and Executive Orders	
	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.
DoD Policy, Directives, and Instructions	
DoD Instruction 4150.07 DoD Pest Management Program dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, Environmental Security	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Instruction (DODI) 4715.03, Natural Resources Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.
OSD Policy Memorandum – 17 May 2005 – Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.
OSD Policy Memorandum – 1 November 2004 – Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum – 10 October 2002 – Implementation of Sikes Act Improvement Act: Updated Guidance	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for

Federal Public Laws and Executive Orders	
	INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-7062, Air Force Comprehensive Planning	Provides guidance and responsibilities related to the USAF comprehensive planning process on all USAF-controlled lands.
AFI 32-7064, Integrated Natural Resources Management	Implements AFPD 32-70, Environmental Quality; DODI 4715.03, Natural Resources Conservation Program; and DODI 7310.5, Accounting for Sale of Forest Products. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-7065, Cultural Resources Management	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFPD 32-70, Environmental Quality	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on January 29, 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

Appendix B. Memorandum of Understanding Between the State of Maryland and the United States Department of Defense Regarding Federal Consistency Requirements of the Coastal Zone Management Act

Memorandum of Understanding Between The State of Maryland And The United States Department of Defense

This Memorandum of Understanding is entered into this 8th day of May, 2013, to evidence and affirm the mutual understanding of the State of Maryland and the United States Department of Defense, the Parties to the Agreement herein, concerning the Federal consistency requirements of the Coastal Zone Management Act (16 U.S.C. § 1451 et seq) and the application and implementation of certain enforceable policies of Maryland's Coastal Zone Management Program.

WHEREAS, the Department of Defense and the State of Maryland are committed to using the Federal consistency process to protect coastal uses and resources within Maryland's Coastal Zone;

WHEREAS, the Coastal Zone Management Act was enacted by Congress on October 27, 1972 to encourage coastal States, Great Lakes States and U.S. territories and commonwealths to be proactive in managing natural resources for their benefit and for the benefit of the Nation with the main objectives of preserving, protecting, developing, and where possible, restoring or enhancing the resources of the Nation's Coastal Zone;

WHEREAS, the Department of Defense is required under the Coastal Zone Management Act to demonstrate consistency to the maximum extent practicable with the approved, enforceable policies of Maryland's Coastal Zone Management Program, as approved by the National Oceanographic and Atmospheric Administration, for all projects and activities having reasonably foreseeable effects on land or water use or natural resources of Maryland's Coastal Zone. The review of activities on Federal lands for consistency with Maryland's Enforceable Coastal Policies only applies to the extent that those activities have reasonably foreseeable effects on coastal uses or resources of the State. Federal lands subject solely to the discretion of the Federal Government, its officers or agents, are excluded from the Coastal Zone under the Coastal Zone Management Act (16 U.S.C. § 1453 (1));

WHEREAS, the State of Maryland first prepared its Coastal Zone Management Program in 1978 and, on November 19, 2010, submitted a Routine Program Change updating its Coastal Zone Management Program to the National Oceanic and Atmospheric Administration for approval. This Routine Program Change, approved by National Oceanic and Atmospheric Administration on March 18, 2011, updates, clarifies, and improves access to Maryland's Enforceable Coastal Policies;

WHEREAS, the Department of Defense participated in the public review of Maryland's November 2010 Routine Program Change, and this participation led to a series of discussions between the Parties and the National Oceanic and Atmospheric Administration Office of Ocean and Coastal Resource Management in which several agreements and understandings were reached on the application of Maryland's Coastal Zone Management Program to Department of Defense activities;

AND, WHEREAS, the parties agreed to reduce those agreements and understandings to writing;

NOW THEREFORE, the Parties agree as follows:

Article I: General

Section 1.01 Terminology: As used throughout this document, "Department of Defense" means components, subordinate services, commands, and installations and not necessarily Cabinet-level activities. Also as used throughout this document, "Policies" refers to Maryland's Enforceable Coastal Policies, effective April 8, 2011 and implemented pursuant to Maryland's Coastal Zone Management Program. "Policy" refers to a specific Maryland Enforceable Coastal Policy.

Section 1.02 State Permits: In general, the obligation of the Department of Defense under the Coastal Zone Management Act is to demonstrate consistency to the maximum extent practicable with the substantive requirements identified in Maryland's Enforceable Coastal Policies. Unless otherwise required under Federal law, the Department of Defense is not required to obtain State permits or comply with any specific State procedural requirements to demonstrate consistency with Maryland's Enforceable Coastal Policies. The Department of Defense may, at its discretion, take advantage of an existing State permitting process or existing State procedural requirement if it determines these processes or requirements are the most convenient and efficient way of demonstrating consistency. The act of the Department of Defense submitting a permit application in such cases does not expand the jurisdiction of any State agency over Department of Defense activities.

Section 1.03 Early Coordination: Prior to providing a consistency determination, the Department of Defense should confer with relevant Maryland agencies early in the planning process on the nature and expected complexity of planned Department of Defense projects and activities. Attachment 1 is appended hereto and lists the Maryland Federal Coastal Consistency

Review Points of Contact. The Department of Defense welcomes Maryland's assistance in determining which Policies are applicable to a given project or activity and developing strategies for achieving and demonstrating consistency with those Policies. At the earliest possible time, Maryland shall notify the Department of Defense of an action that the Department of Defense has not provided a consistency determination for, but which may have a reasonably foreseeable effect on Maryland's Coastal Zone.

Section 1.04 List of *de minimis* and Environmentally Beneficial Activities and General Consistency Determinations: The Department of Defense and Maryland agree to work together to develop a list of *de minimis* activities and a list of environmentally beneficial activities, as these terms are defined in 15 C.F.R. § 930.33. The List of *de minimis* and Environmentally Beneficial Activities will be appended hereto as Attachment 2 following completion of the procedures outlined in 15 C.F.R. § 930.33. Absent unusual circumstances, the projects and activities on these lists will require no individual consistency determination. Either Party may recommend revisions to this list at any time. Projects and activities can be added to this list with the agreement of both Parties through the process under 15 C.F.R. §930.33. Either Party can modify or remove an item from this list in accordance with Section 3.03 of this Memorandum of Understanding.

Section 1.05 Federal Consistency Determination Process: In accordance with 15 C.F.R. § 930.33(a), the Department of Defense shall determine which of its activities affect coastal uses or resources. For Federal agency projects and activities that have reasonably foreseeable effects on any coastal use or coastal resource on Maryland's Coastal Zone, the Department of Defense will submit a consistency determination in accordance with 15 C.F.R. § 930 et seq, identifying the relevant Maryland Enforceable Coastal Policies and demonstrating the consistency of the project or activity with those Policies. Attachments 1, 3 and 4 contain the Federal consistency submission and approval process.

Section 1.06 Exceptions: Any time the circumstances of a particular project or activity that would otherwise fall under Attachment 2 indicate that there may be adverse coastal effects, the Department of Defense will prepare and submit a Federal Coastal Consistency Determination for that individual project or activity.

Section 1.07 Options for Demonstrating Consistency: The Department of Defense and Maryland agree that Integrated Natural Resources Management Plans ("INRMPs") or consultation with Maryland may be appropriate options for demonstrating consistency. Consulting with Maryland or implementing an INRMP does not however relieve the Department of Defense of its obligation to submit a written consistency determination when required by the Coastal Zone Management Act. Rather, the Department of Defense may, where appropriate, point to relevant provisions of an INRMP or consultation with Maryland in a written consistency determination to demonstrate consistency with certain Maryland Enforceable Coastal Policies. Additionally, the Department of Defense may, at its discretion, utilize Maryland's administrative processes,

including but not limited to permits, to assist in demonstrating consistency with the substantive requirements of Maryland's Enforceable Coastal Policies. When resources are available and environmental benefits will accrue, the Department of Defense may, at its discretion and with Maryland concurrence, perform mitigation above and beyond that required to demonstrate consistency. These additional mitigation measures will be documented by the Department of Defense and Maryland, and may be used to meet mitigation requirements for future Department of Defense projects and activities.

Section 1.08 Mapping / Alternative Sites - Oyster Reefs, Trout Waters and Colonial Bird Nesting Sites: To address potential impacts to specific habitats that would have reasonably foreseeable effects to coastal uses or resources of Maryland and to provide greater specificity to the application of the policies, Maryland is creating a coastal atlas which will delineate the geographic areas of significance referred to in Maryland's Enforceable Coastal Policies B.1.1, B.2.1 and B.6.5. Maryland will make the coastal atlas available to the Department of Defense and the general public. The Department of Defense may share with Maryland any information previously collected and included in the INRMP that the State could use in creating the coastal atlas.

Article II. Specific Maryland Enforceable Coastal Policies for the Purpose of Federal Consistency Determinations:

Section 2.01 General Policies: Core Policies (Noise): The Department of Defense will demonstrate consistency with this Policy for new activities having a reasonably foreseeable effect on the Coastal Zone, other than aircraft operations. Compliance with internal Department of Defense and military service component noise abatement policies will be sufficient to demonstrate consistency with this Policy for such projects.

Section 2.02 General Policies: Water Quality (Pesticide Storage): The Department of Defense will demonstrate consistency with Maryland's Enforceable Coastal Policies regarding pesticide storage through compliance with Department of Defense Instruction 4150.07, "DoD Pest Management Program".

Section 2.03 General Policies: Water Quality (Toxic Discharges): The Department of Defense will continue to demonstrate consistency with this Policy by applying for and complying with permits required under the Clean Water Act and the relevant section of the Code of Maryland Regulations, currently 26.08.03.01.

Section 2.04 General Policies: Flood Hazards: The Department of Defense and Maryland agree that Policy A.3.2 does not establish absolute prohibitions against development on Department of Defense lands by Federal agencies.

Section 2.05 Coastal Resources: The Chesapeake and Atlantic Coastal Bays Critical Area: The Department of Defense and Maryland agree to continue discussing appropriate measures to demonstrate consistency with Maryland's Enforceable Coastal Policies related to the Chesapeake Bay and Atlantic Coastal Bays Critical Areas, including the development and maintenance of a List of *de minimis* and Environmentally Beneficial Activities, addressed in Section 1.04.

Section 2.06 Coastal Resources: Tidal and Non-Tidal Wetlands: The Department of Defense will consult with Maryland to ensure projects that may alter wetlands are consistent to the maximum extent practicable with the intent of this Policy. Maryland and the Department of Defense recognize that wetland impacts may be unavoidable due to mission requirements. In instances where adverse wetland impacts cannot be avoided, the Department of Defense and Maryland will work together to ensure any adverse effects to the Maryland Coastal Zone are minimized, any environmental benefits are maximized, and Department of Defense's operational flexibility is maximized. By submitting a Joint Permit Application under Clean Water Act Sections 404/401 to the appropriate regulatory agencies, the Department of Defense demonstrates consistency with the substantive requirements of Maryland's Enforceable Coastal Policies.

Section 2.07 Coastal Resources: Forests: The Department of Defense will demonstrate consistency with the underlying conservation goals of the Forest Conservation Act as embodied in Maryland's Enforceable Coastal Policies to the maximum extent practicable. An installation's INRMP may be sufficient for this purpose. For land-disturbing activities of 40,000 square feet or greater occurring on an installation, the Department of Defense will submit to Maryland either a negative determination with a finding of no effect to coastal uses or resources, or a consistency determination. If the Department of Defense proposes an action that will have reasonably foreseeable effects on uses or resources of Maryland's Coastal Zone, then the Department of Defense must be consistent to the maximum extent practicable with the substantive provisions of the Forest Conservation Act related to the reasonably foreseeable effects. The Department of Defense is not required to meet the procedural requirements of the Forest Conservation Act, such as creating and submitting forest conservation plans, forest stand delineation plans, or Long-Term Protective Agreements to Maryland. Likewise, the Department of Defense may not contribute to the State Forest Conservation Fund. However, the Department of Defense may, at its discretion and consistent with Federal fiscal legal requirements, follow Maryland's administrative process to assist in demonstrating consistency with the substantive requirements of Maryland's Enforceable Coastal Policies.

Section 2.08 Coastal Resources: Historical and Archaeological Sites: The Department of Defense will continue to use procedures in accordance with the requirements of the National Historic Preservation Act that are consistent with Maryland's Historical Preservation Program. Maryland agrees that meeting the consultation requirements under the National Historic

Preservation Act is sufficient to demonstrate consistency with Policies relating to historic preservation. In the event a tidal shore erosion project affects historical or archaeological resources, the Department of Defense will continue to use the consultation procedures under the National Historic Preservation Act that are consistent with Maryland's Historic Preservation Program.

Section 2.09 Coastal Resources: Living Aquatic Resources: Each INRMP maintains a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups, and may include State-listed endangered and threatened species. INRMPs are prepared, maintained, and implemented for all installations and ranges that contain significant natural resources for which the Department of Defense has authority for, or control of, natural resources management pursuant to the Sikes Act, 16 U.S.C. § 670 et seq. Maryland will continue to participate in the development and review of all INRMPs. Each Department of Defense component should ensure, to the extent practicable, that current and planned installation programs, plans, and projects that affect natural resources are integrated and compatible with INRMPs. Each INRMP requires that biologically or geographically significant or sensitive natural resources, such as ecosystems or species, are monitored and managed for their protection and long-term sustainability. The INRMP reflects the mutual agreement between Maryland Department of Natural Resources, the United States Fish and Wildlife Service and the Department of Defense concerning conservation, protection, and management of fish and wildlife resources, and it may be used to demonstrate consistency with Maryland's Enforceable Coastal Policies. If there are reasonably foreseeable effects on living aquatic resources as described in Maryland's Enforceable Coastal Policies, the Department of Defense and Maryland will work together to ensure any adverse effects are minimized, any environmental benefits are maximized, and the Department of Defense's operational flexibility is maximized.

Section 2.10 Coastal Uses: Tidal Shore Erosion Control (Living Shoreline): When, after consultation with Maryland, the Department of Defense determines that mission requirements or safety may be threatened by wildlife attracted to living shoreline habitats, less preferred alternatives for shoreline stabilization, such as hardened structures, should be considered consistent to the maximum extent practicable with this Policy. By submitting a Joint Permit Application under Clean Water Act Sections 404/401 to the appropriate regulatory agencies, the Department of Defense demonstrates consistency with the substantive requirements of Maryland's Enforceable Coastal Policies.

Article III. General Statements of Understanding

Section 3.01 Effective Date: This Memorandum of Understanding shall be effective as of the date of the last signature shown below and shall not expire.

Section 3.02 Pursuant to the Anti-Deficiency Act, 31 U.S.C. §§ 1341 and 1342, this Memorandum of Understanding makes no commitments of funds. Nothing in this Memorandum

of Understanding will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury.

Section 3.03 Amendment and Termination: This Memorandum of Understanding and attachments may be modified or amended upon written request of any Party hereto and the subsequent written concurrence of the other Party. Moreover, this Memorandum of Understanding may be terminated sixty (60) days after providing written notice of such termination to the other Party.

Section 3.04 This Memorandum of Understanding does not create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by any person or Party against the United States, its agencies, its officers; or against the State of Maryland, its agencies, its officers; or against any other person. This Memorandum of Understanding is to be construed in a manner consistent with all existing laws and regulations.

Section 3.05 This Memorandum of Understanding neither expands nor is in derogation of those powers and authorities vested in the Parties by applicable law, statutes, regulations, or Executive Orders, nor is it intended to modify or supersede any other applicable interagency agreements existing as of the date of this Memorandum of Understanding. The Parties enter into this agreement in good faith and intend to fully carry out the terms of this Memorandum of Understanding.

Section 3.06 The Parties will meet at least every two years to discuss this Memorandum of Understanding and its Attachments.

Signed this 8th day of May, 2013.

For the State of Maryland:

John Griffin, Secretary
Maryland Department of Natural Resources

David Costello, Deputy Secretary
Maryland Department of the Environment

For the U.S. Department of Defense:

Donald R. Schregardus, Deputy Assistant Secretary of the Navy for Environment

Hershell E. Wolfe, Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health

Gerald F. (Fred) Pease Jr, Deputy Assistant Secretary of the Air Force for Environment, Safety and Occupational Health

Memorandum of Understanding between the State of Maryland and The United States Department of Defense[1]

Attachment 2: List of *de minimis* and Environmentally Beneficial Activities

This process is for Federal consistency purposes pursuant to the Coastal Zone Management Act (16 U.S.C. § 1451 et seq.) only and in no way relieves the United States Department of Defense (hereinafter "DoD") from any other applicable Federal, State, or local laws, regulations or other requirements.

Section I contains a list of Federal agency activities (hereinafter "activities") that typically have minor or *de minimis* effects on coastal uses and resources in the Maryland Coastal Zone. *De minimis* activities are activities that are expected to have insignificant direct or indirect (cumulative and secondary) coastal effects and which the State agency concurs are *de minimis*.

Section II contains environmentally beneficial activities that have beneficial impacts on the natural resources of Maryland's Coastal Zone. "Environmentally beneficial activities" means an activity or activities that protect, preserve, or restore the natural resources of the Coastal Zone.

Upon approval by Maryland in accordance with 15 C.F.R. 930.33(a)(3) or 15 C.F.R. 930.36(c), DoD may generally carry out these activities without submitting a negative Federal Coastal Consistency Determination unless the circumstances of a particular Federal Development Project (hereinafter "Project") or activity indicate that the activity will have a greater than *de minimis* adverse effect on coastal uses or resources. In determining whether a particular activity qualifies as *de minimis* or as having an environmentally beneficial impact, each project or activity should be evaluated individually, taking into account the cumulative effects of all previous, current, and planned activities on and around the installation and the proximity of the project or activity to any coastal uses or resources. For an activity to be considered *de minimis*, wetland impacts shall be limited to 5,000 square feet or less. Land disturbing activities that include grubbing may require further assessment.

Best management practices ("BMPs") will be implemented for each activity to protect water quality, coastal uses, and coastal resources. For the list of *de minimis* or environmentally beneficial activities BMPs are defined as resource management decisions that are based on the latest professional and technical standards for the protection, enhancement, and rehabilitation of natural resources. BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce pollution. BMPs also include treatment requirements, operating procedures, and control practices. (*Department of Defense Instruction, Number 4715.03, "Natural Resources Conservation Program"*, March 18, 2011)

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[1] Until Maryland concurs and the process described in 15 C.F.R. § 930.33 is complete, the Department of Defense will continue to follow the procedures outlined in 15 C.F.R. § 930.33 et seq.

I. Examples of *de minimis* Activities: Pursuant to 15 C.F.R. § 930.33(a)(3)(i), the list of *de minimis* activities identifies those activities not subject to further State agency review for Federal consistency in accordance with the Coastal Zone Management Act.

a. Existing buildings, facilities or structures: The following list of projects on existing buildings or structures are considered *de minimis* so long as the building or structure is not eligible for listing on the National Register of Historic Places. If the structure is determined eligible for listing, the project must have been determined by the appropriate cultural resources manager to have no adverse effect on the building or structure.

1. Exterior painting, staining or sealing of existing building/infrastructure
2. Brick repointing
3. Repair but not replacement of building foundations
4. Repair and replacement of roofs, windows, scuppers, gutters, or snow guards
5. HVAC modernization to include a new pad in the same footprint as the current pad so long as the new pad is not larger than the current pad
6. Water softener restoration
7. Repair and replacement of sump pump(s)
8. Repair and replacement of exterior door(s)
9. Installation, repair, and maintenance of solar panel(s) and wall(s) taking place within or upon existing structures or existing impervious surface area(s)
10. Exclusively external structural and cosmetic alterations to existing buildings or structures as long as any ground disturbance is within the same foot print (e.g., installation of a canopy that is harmonious and compatible with the appearance and character of the existing building and does not contribute to additional stormwater pollution)

b. Road Maintenance and Parking Maintenance (within the same footprint or less):

1. Routine repairs including but not limited to milling, grooving, stripping, repairing (patching or slurry seal), striping, or resurfacing that does not result in a net increase in stormwater discharge
2. Barrier skirt and pop up barrier maintenance and repair

c. Grounds Maintenance:

1. Grading and sodding of existing athletic and parade fields
2. Routine grounds maintenance, including but not limited to mowing existing mowed areas; seeding/reseeding; planting and replacement of flowers, trees and shrubs; and hiking trail maintenance

3. Maintenance of vegetation within existing firebreaks, airfield/radar clear zones, airfield imaginary surfaces, firing lines, lines of sight, ranges, anti-terrorism/force protection fence lines, and building clearance requirements not involving grubbing or other excavation
4. Maintenance and in-kind replacement of existing fencing

d. Utilities:

1. Repair and in-kind replacement of underground utility lines (such as fiber optic, water, and electric lines)
2. Maintenance of vegetation within existing utility clearance zones, rights-of-way and easements that does not involve grubbing or other excavation
3. Utility line maintenance and repair including but not limited to maintenance and repair of sewer lines, steam lines, gas lines, fire mains, and water lines
4. Cleaning of storm drain inlets and swales
5. Repair and maintenance of existing piping under roads and culverts
6. Maintenance and repair of aboveground storage tanks, underground storage tanks, and fuel lines
7. Studies (such as archeological investigations, periodic sampling, and geotechnical studies) for utility projects that require excavation but do not exceed 5,000 square feet of land disturbance and does not include grubbing
8. Maintenance, repair, and replacement of streetlights
9. Cleaning, maintenance, repair, and replacement of the following facilities and devices, to include removal of vegetation, including trees and shrubs, without grubbing or excavation, when other State or Federal permits are not required:
    a. Existing drainage facilities,
    b. Stormwater management devices, and
    c. Water quality facilities and devices
10. Roadside ditch regrading
11. Retrofit and redesign of existing drainage facilities that use environmental site design to the maximum extent practicable
12. In-kind replacement, reconstruction, repair, and modification of existing lighting, guardrails, traffic and pedestrian signals, curbs and gutters, sidewalks and ramps, variable message signs, and Americans with Disabilities Act compliant retrofits
13. Maintenance, repair, and replacement of existing railroad structures

e. Military Operations and Training: Activities described in this section shall be under 5,000 square feet of new land disturbance.

1. Installation of temporary metal plates, target poles, and targets and maintenance and replacement of catch boxes on existing ranges
2. Temporary placement and use of simulated target fields (e.g., inert mines, simulated mines, or passive hydrophones) in fresh, estuarine, and marine waters for the purpose of non-explosive research, development, test, and evaluation
3. Short term increases in air operations up to 50 percent of the typical operation rate, or increases of 50 operations per day, whichever is greater
4. Routine testing and evaluation of military equipment on a military reservation or an established range, restricted area, or operating area; similar in type, intensity and setting, including physical location and time of year, to other actions for which it has been determined, through NEPA analysis where a Department of Defense agency was a lead or cooperating agency, that there are no significant impacts; and conducted in accordance with all applicable standard operating procedures protective of the environment
5. Routine military training associated with transits, maneuvering, safety and engineering drills, replenishments, flight operations, and weapons systems conducted at the unit or minor exercise level; similar in type, intensity and setting, including physical location and time of year, to other actions for which it has been determined, through NEPA analysis where a Department of Defense was a lead or cooperating agency, that there are no significant impacts; and conducted in accordance with all applicable standard operating procedures protective of the environment.

f. Miscellaneous:

1. Preliminary engineering and technical studies
2. Non-invasive inspections, educational programs, and environmental surveys
3. Normal agricultural operations performed as part of an agricultural out-lease contract as described in the installation's approved Integrated Natural Resources Management Plan (hereinafter "INRMP")
4. Recreational hunting and fishing programs and routine fish and wildlife habitat management projects as described in the installation's approved INRMP
5. Prescribed burning for purposes of natural resources management, maintaining military operations, and wildfire prevention as described in the installation's approved INRMP
6. Installation, maintenance, repair, and replacement of signage that does not significantly affect coastal resources
7. Renewal of existing lease agreements, licenses, and easements under the same or nearly the same conditions that existed prior to renewal

8. Hosting or participating in military ceremonies and public events such as air shows, open houses, Earth Day events, National Public Lands Day events, conferences, concerts, and athletic events where no permanent changes to installation infrastructure are required to accommodate all aspects of the event
9. Routine movement, handling, and distribution of materials, including hazardous materials and wastes, that are moved, handled, or distributed in accordance with existing, applicable regulatory requirements and permits
10. Transfer of real property from DoD to another Federal agency
11. Receipt of real property from another Federal agency when there is no anticipated or proposed substantial change in land use
12. Disposal of excess easement interests to the underlying fee owner where the easement is not part of an existing DoD environmental impact mitigation measure
13. Relocation of personnel into existing Federally-owned or commercially leased space that does not involve a substantial change affecting the supporting infrastructure (e.g. no increase in vehicular traffic beyond the capacity of the existing road network to support such an increase)
14. Installation of devices to protect human or animal life (e.g., raptor electrocution prevention devices, fencing to restrict wildlife movement onto airfields, and fencing and grating to prevent accidental entry into hazardous areas)

II. Environmentally Beneficial Activities: Pursuant to 15 C.F.R. § 930.33(a)(4), the list of environmentally beneficial activities are excluded from further State agency consistency review.

a. The following activities are considered beneficial, and are not primarily for the purpose and benefit of stormwater BMPs or mitigation as a result of a permitted activity:

1. Stand alone low-impact development retrofit or enhancement activities including but not limited to:
    a. Replacement of impervious surface with permeable materials or any form of low impact development design
    b. Stormwater retrofits
    c. Demolition, disposal, or improvement of National Register of Historic Places ineligible structures or infrastructure that includes Maryland-approved sediment/erosion control measures and results in reduced impervious surface or increased ecosystem service providing vegetation.
    d. Construction and installation of grass swales

   e. Installation, maintenance, repair, and replacement of rain barrels, dry wells, and cisterns to manage stormwater runoff from existing structures
   f. Installation, maintenance, and repair of green roof
2. Vegetative invasive species removal pursuant to the installation's approved INRMP
3. Reintroduction of endemic or native species (other than endangered or threatened species) into their historic habitat where no substantial site preparation is involved
4. Existing living shoreline restoration, maintenance and repair so long as any coastal disturbance is returned to its pre-disturbance condition. During staging operations, BMPs will be applied
5. Wetland creation and enhancement that does not involve excavation or clearing of forested buffers
6. Forest enhancement (clearing and replanting) in accordance with the installation's approved INRMP
7. Silviculture in accordance with the installation's approved INRMP
8. Implementation of an Urban Forest Management Plan in accordance with the installation's approved INRMP
9. Replacement of aboveground utilities with underground utilities using directional drilling and avoiding coastal uses and resources

Appendix C. Memorandum of Agreement Among the United States Air Force, Andrews Air Force Base, The National Park Service, National Capital Parks – East, and Maryland State Historic Preservation Office for the Management of Flight Obstructions on Suitland Parkway to Preserve Flight Safety at Andrews Air Force Base

Suitland Parkway airspace obstruction management Memorandum of Agreement, 02/2003

MEMORANDUM OF AGREEMENT
AMONG THE
UNITED STATES AIR FORCE, ANDREWS AIR FORCE BASE,
THE NATIONAL PARK SERVICE, NATIONAL CAPITAL PARKS-EAST,
AND
MARYLAND STATE HISTORIC PRESERVATION OFFICE
FOR THE
MANAGEMENT OF FLIGHT OBSTRUCTIONS ON SUITLAND
PARKWAY TO PRESERVE FLIGHT SAFETY
AT ANDREWS AIR FORCE BASE

Whereas, the United States Air Force (Air Force) at Andrews Air Force Base (AFB) provides worldwide airlift and logistical support for the President of the United States, the Vice President, and other U.S. and foreign dignitaries;

Whereas flight operations at Andrews AFB use two parallel runways oriented north and south and to ensure safety of flight operations, runways must comply with Unified Facilities Criteria (UFC) 3-260-01, Airfield and Heliport Planning and Design (1 Nov 01) and with the Federal Aviation Regulations (FAR), Title 14 Code of Federal Regulations (CFR) Part 77, which provide criteria for unobstructed airspace and safe and efficient ground movements, including specific criteria for unobstructed airspace around Air Force runways (14 CFR 77.28);

Whereas, trees in several nearby areas have grown tall enough to penetrate airspace that must be free of obstructions to allow safe approaches and departures of military aircraft (UFC 3-260-01 para 3.15.3) including Air Force One, the presidential aircraft, and continued unmanaged growth of trees close to the runways will result in a greater number of obstructions than what currently exists;

Whereas, if action is not taken, many aircraft that routinely use the runways will no longer be able to operate safely on Andrews AFB, including Air Force One;

Whereas, Andrews AFB proposes to undertake managing vegetation to reduce flight obstructions, hereinafter referred to as the undertaking, as described in the *Environmental Assessment for Managing Flight Obstructions to Preserve Safety at Andrews Air Force Base, December 2002 (EA)*;

Whereas, Andrews AFB has determined that the proposed undertaking will have no effect on historic properties within the boundaries of the installation;

Whereas, some of the present and future tree obstacles are located within an area of approximately 35 acres of mature deciduous trees along a one-mile narrow strip of forest within the corridor of Suitland Parkway, a 9.18-mile divided parkway that links Prince Georges County, Maryland and downtown Washington, D.C.;

Whereas, the Suitland Parkway was originally constructed during World War II as a military road, that in 1949 was authorized by Congress (63 Stat 612) as an extension of the park system of the District of Columbia and its environs; to be developed, operated, and administered as a limited access road primarily to provide a dignified, protected, safe, and suitable approach for passenger-vehicle traffic to the National Capital and for an uninterrupted means of access between the several Federal establishments adjacent thereto and the seat of government in the District of Columbia;

Whereas Suitland Parkway was listed on the National Register of Historic Places in 1995 and is managed by National Capital Parks-East (NACE) as a unit of the National Park System administered by the National Park Service (NPS) subject to the provisions of the Act of Congress approved August 25, 1916 (39 Stat 535) and other applicable laws;

Whereas the Parkway's trees provide a rural setting and a scenic park-like experience for the driving public, including dignitaries arriving by plane at Andrews AFB and traveling to the National Capital;

Whereas this landscape characteristic is typical of the system of parkways developed in many urban areas during the first half of the 20th Century and is a contributing feature of the Parkway's historic significance;

Whereas most of the tree obstructions on the south side of Suitland Parkway need to have their crowns reduced to heights of approximately 40 to 50 feet (depending on exact position and topography) to provide the required clearance;

Whereas most of the canopy trees will require removal rather than reducing their crowns to this extent to avoid their death or deformation;

Whereas many trees on the north side of Suitland Parkway may have their crowns reduced to heights of approximately 50 to 60 feet (depending on exact position and topography) to provide the required clearance, and while greater numbers are expected to survive, many trees on the north side will also require removal;

Whereas all parties seek to comply with the National Historic Preservation Act, 16 U.S.C. § 470, *et seq.*, as implemented by 36 C.F.R. Part 800;

Whereas Andrews AFB, NACE and the Maryland State Historic Preservation Office (SHPO) have determined the undertaking has the potential to have an adverse effect on characteristics contributing to Suitland Parkway's listing on the National Register of Historic Places;

Whereas Andrews AFB has consulted with NACE and the SHPO pursuant to 36 C.F.R. § 800.6 to resolve such potential adverse effects; and

Whereas Andrews AFB and NACE have notified and informed the Advisory Council on Historic Preservation (ACHP) and the SHPO of their intent, in accordance with 36 CFR

800.2(d)(3), to coordinate public involvement for purposes of Section 106 review with public involvement in the EA prepared under the National Environmental Policy Act (NEPA).

Whereas, the Maryland Department of Natural Resources (MDNR) has participated in consultation regarding this undertaking, and been invited to concur in this Memorandum of Agreement (MOA);

Whereas, in accordance with commitments made in its EA, Andrews AFB in cooperation with NACE will prepare and implement a succinct Vegetation Management Plan (VMP) to guide conduct of the entire undertaking both within the boundaries of Andrews AFB and outside such boundaries along Suitland Parkway;

Now, therefore Andrews AFB, NACE, and SHPO agree the undertaking shall be implemented in accordance with the following stipulations:

STIPULATIONS

Andrews AFB and NACE will ensure the following stipulations are implemented

Supplemental Implementation Plan

A. Andrews AFB will fund, and Andrews AFB and NACE in consultation with the SHPO and MDNR shall jointly develop, a detailed Supplemental Implementation Plan (SIP) providing specific details for work to be carried out on the Suitland Parkway. The SIP may be prepared subsequent to issuance of the overall VMP, but upon adoption will become part of the VMP.

B. Andrews AFB and NACE will ensure the SIP:

is prepared by or under the supervision of a professional botanist/arborist or other tree care expert licensed by the State of Maryland, and that they follow all applicable federal, state, and local laws/codes pertaining to tree management and prepare the plan accordingly;

2. identifies the exact boundaries of forested areas;

3. identifies all trees that are currently obstructions penetrating the airspace required for safe aircraft operations (i.e. the approach-departure or transitional surfaces for the runways) in accordance with the all Federal Aviation Administration (FAA) regulations;

4. identifies all trees likely to become obstructions within two years after the date of the SIP;

5. provides a strategy, a replacement criteria ratio and schedule for management and long-term control of obstructions to achieve compliance with UFC and FAA criteria;

6. identifies the resources necessary to implement the SIP; and

7. provides for periodic review and amendment as needed.

C. Subject to modification as the result of analyses and consultations carried out as part of SIP preparation, it is anticipated that the SIP will:

provide for a combination of tree crown reduction, tree replacement, and directed natural succession to a stable community of desirable native species;

2. give priority to crown reduction over removal whenever possible to maintain maximum tree heights without penetrating the airspace needed for safe operations under UFC and FAA criteria;

3. provide for the removal of invasive exotic trees and other trees identified by the SIP as undesirable in terms of forest health and aesthetics;

4. provide for the replacement of trees that are eliminated or fail to survive trimming with low-growing trees of a regionally indigenous species incapable of growing to the imaginary approach-departure surface height, planted where needed, not necessarily in the same locations as the trees that are removed or fail to survive.

5. replacement of cut/removed trees in a manner that promotes the recovery of a "natural" woodland character adjacent to the Parkway.

6. provide for re-growth of the interior forest in a manner designed to expedite forest recovery, with replanting only as needed, supplementing a program of directing natural re-growth and succession.

7. adhere to appropriate silvicultural concepts to effectively manipulate the succession towards a native, low growing, stable

tree-shrub community that will minimize adverse visual impacts and create a cover that is relatively resistant to tree invasion

8. provide for tree removal in phases over two or three years to minimize sudden aesthetic changes to forested areas;

9. provide for tree replacement that restores the woodland character of the Parkway where trimming or removal alters this character;

10. provide for regular management and maintenance of trees to ensure there is no growth through the imaginary surfaces;

11. be implemented under the direction of National Park Service and Air Force professionals; and supervision of a professional arborist or other tree care expert licensed by the State of Maryland; and

12. provide a scheduled periodic review and revision as necessary in consultation with MDNR and SHPO.

D. When the SIP is complete in draft form, Andrews AFB and NACE will provide the draft to MDNR and SHPO for review and comment, and consult with them as necessary in addressing their comments in the final SIP. Disputes regarding the SIP will be resolved in accordance with Section III – Resolving Objections.

E. Andrews AFB and NACE will file copies of the final SIP with MDNR and SHPO.

F. Andrews AFB and NACE will ensure that the SIP is implemented. The Air Force will fund initial implementation and the Air Force and NPS will agree on funding for the long-term management of the vegetation when the methodology of the SIP is determined for ongoing maintenance.

G. Andrews AFB may implement those aspects of the VMP not involving Suitland Parkway and not covered by the SIP prior to completing the SIP or initiating its implementation.

II. Archeology

A. Andrews AFB and the NACE will conduct such archeological test excavations as they determine in consultation with the SHPO to be needed in any areas that may be disturbed by the undertaking and that fall within the approximately 24 acre area regarded as having high archeological site probability, as identified in (cite report of "Phase IA" archeological survey).

tree-shrub community that will minimize adverse visual impacts and create a cover that is relatively resistant to tree invasion

8. provide for tree removal in phases over two or three years to minimize sudden aesthetic changes to forested areas;

9. provide for tree replacement that restores the woodland character of the Parkway where trimming or removal alters this character;

10. provide for regular management and maintenance of trees to ensure there is no growth through the imaginary surfaces;

11. be implemented under the direction of National Park Service and Air Force professionals; and supervision of a professional arborist or other tree care expert licensed by the State of Maryland; and

12. provide a scheduled periodic review and revision as necessary in consultation with MDNR and SHPO.

D. When the SIP is complete in draft form, Andrews AFB and NACE will provide the draft to MDNR and SHPO for review and comment, and consult with them as necessary in addressing their comments in the final SIP. Disputes regarding the SIP will be resolved in accordance with Section III – Resolving Objections.

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II. Archeology

A. Andrews AFB and the NACE will conduct such archeological test excavations as they determine in consultation with the SHPO to be needed in any areas that may be disturbed by the undertaking and that fall within the approximately 24 acre area regarded as having high archeological site probability, as identified in (cite report of "Phase IA" archeological survey).

B. Should testing reveal archeological resources, Andrews AFB and NACE will ensure they are either protected from damage by the undertaking or evaluated in accordance with 36 C.F.R. § 800.4(c).

C. Andrews AFB and NACE will ensure that any archeological resources determined eligible for inclusion in the National Register of Historic Places pursuant to 36 C.F.R. § 800.4(c) are managed in consultation with the SHPO and any concerned Indian tribe or other descendant community in accordance with the guidance provided by the ACHP in its "Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites" (64 Fed. Reg. 27085-87, May 18, 1999).

III. Resolving Objections.

A. Should any signatory to this agreement object in writing to any other signatory regarding any action carried out or proposed with respect to the undertaking or implementation of this agreement as it relates to the SIP, Andrews AFB and NACE shall consult with the objecting signatory to resolve the objection. If after initiating 106 consultation, Andrews AFB and NACE, determine that the objection cannot be resolved through consultation, Andrews AFB and NACE shall forward all documentation relevant to the objection to the ACHP, including Andrews AFB's and NACE's proposed response to the objection, with the expectation that within 30 days after receipt of all pertinent documentation, the ACHP will exercise one of the following options:

1. Advise Andrews AFB and the NACE that the ACHP concurs in Andrews AFB's and NACE's proposed response to the objection, whereupon Andrews AFB and NACE will respond to the objection accordingly;

2. Provide Andrews AFB and NACE with recommendations which Andrews AFB and NACE shall take into account in reaching a final decision regarding its response to the objection; or

3. Notify Andrews AFB and NACE that the objection will be referred for comment pursuant to 36 C.F.R. § 800.7(a)(4), and proceed to refer the objection and comment. Andrews AFB and NACE shall take the resulting comment into account in accordance with 36 C.F.R. § 800.7(c)(4) and Section 110(l) of NHPA, 16 U.S.C. § 470h-2.

B. Should the ACHP not exercise one of the above options within 30 days after receipt of all pertinent documentation, Andrews AFB and NACE may assume the ACHP's concurrence in their proposed response to the objection.

C. Andrews AFB and NACE shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; Andrews AFB's and NACE's responsibility to carry

out all actions under this agreement that are not the subjects of the objection shall remain unchanged.

D. At any time during implementation of the measures stipulated in this agreement, should an objection pertaining to this agreement or the effect of the undertaking on historic properties be raised by an individual or group with a demonstrated interest in the undertaking, Andrews AFB and NACE shall notify the signatories to this agreement and take the objection into account.

IV. Amendment and Termination

A. If any of the signatories to this agreement determine that a change in its terms is necessary, the signatory shall immediately request that the other signatories consider an amendment or addendum to the agreement to effect that change. Such an agreement or addendum will be executed in the same manner as the original agreement.

B. If Andrews AFB or NACE determines that it cannot implement the terms of this agreement, or if another signatory determines that the agreement is not being properly implemented, such signatory may propose to the other signatories to this agreement that it be terminated.

1. The signatory proposing to terminate this agreement shall so notify all signatories to this agreement, explaining the reasons for termination and affording them at least 30 days to consult and seek alternatives to termination. The signatories shall then consult.

2. Should such consultation fail, Andrews AFB, NACE or any other signatory may terminate the agreement by so notifying all signatories.

3. Should this agreement be terminated, Andrews AFB and NACE shall either:

a. Consult in accordance with 36 C.F.R. § 800.6 to develop a new agreement; or

b. Request the comments of the ACHP pursuant to 36 C.F.R. § 800.7.

C. If the terms of this agreement have not been implemented by 30 Sept 2008, this agreement shall be considered null and void. In such event Andrews AFB and NACE shall so notify the signatories to this agreement, and if they choose to continue with the undertaking, shall re-initiate review of the undertaking in accordance with 36 C.F.R. Part 800. The signatories understand that long-term maintenance implementation is not a criterion for voiding this agreement.

V Acceptance of Terms

Approval of this agreement constitutes acceptance of the terms of this agreement. Compliance with the terms of this agreement shall satisfy Andrews AFB and NACE responsibilities under Sections 106 and 110 of the NHPA, (16 U.S.C. § 470f and § 470h-2) as implemented by 36 C.F.R. Part 800, as well as the requirement of Section 2.b. of Executive Order 11593, *Protection and Enhancement of the Cultural Environment*. Andrews AFB, NACE, and the SHPO agree to fully comply with the terms of this agreement.

VI. Funding, Effective Date

A. Any requirement for payment of funds by Andrews AFB, the Air Force, NACE, and the NPS established by terms of this agreement, shall be subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act (31 U.S.C. § 1341). In the event that the Andrews AFB is unable to carry out the terms of this agreement due to the provisions of the Anti-Deficiency Act (31 U.S.C. § 1341), Andrews AFB shall advise the NACE and the SHPO and shall re-initiate consultation pursuant to 36 C.F.R. § 800.6.

B. This MOA shall become effective when signed by all signatories to the agreement.

Execution of this agreement by Andrews AFB, NACE and the SHPO, and its submission to the ACHP in accordance with 36 C.F.R. § 800.6(b)(1)(iv), shall, pursuant to 36 C.F.R. § 800.6(c), be considered to be an agreement with the ACHP for the purposes of Section 110(l) of NHPA, 16 U.S.C. § 470h-2. Execution and submission of this MOA, and implementation of its terms evidence that Andrews AFB and NACE has provided the ACHP an opportunity to comment on the undertaking and its effects on historic properties, and that Andrews AFB and NACE sufficiently taken into account the effects of the undertaking on historic properties.

4) Signatory pages Attached:

1. Andrews AFB
2. NACE
3. SHPO
4. MDNR

Suitland Parkway airspace obstruction management Memorandum of Agreement, 02/2003

Andrews Air Force Base

Glenn F Spears 26Feb2003

GLENN F. SPEARS (date)
Brigadier General, USAF
Commander, 89th Air Wing

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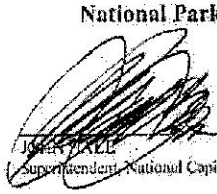
Suitland Parkway airspace obstruction management Memorandum of Agreement, 02/2003

National Park Service, National Capital Parks-East



03/04/03
(date)

JOHN PULL
Superintendent, National Capital Parks-East

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Suitland Parkway airspace obstruction management Memorandum of Agreement, 02/2003

Maryland State Historic Preservation Office

3-7-03
(date)

J. RODNEY LITTLE
State Historic Preservation Officer

11

Maryland Department of Natural Resources- Forest Service

Steven W. Koehn 2/27/03

STEVEN W. KOEHN (date)
Director/State Forester
Maryland Department of Natural Resources-Forest Service

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Appendix D. JBA Management Plan for the Federally-Endangered Sandplain Gerardia (*Agalinis acuta*)

1. Introduction

This section serves as a planning/guidance document for future management the sandplain gerardia (*Agalinis acuta*), the only Federally listed endangered plant known to be present at Andrews AFB. The plan includes an introduction describing the overall management situation; a discussion of specific management issues and concerns; management goals and objectives to address issues and concerns; and a five-year work plan. The work plan describes projects and activities to be accomplished within the following five-year period to address the management goals and objectives.

2. Sandplain Gerardia Management Action Plan

This management action plan for sandplain gerardia is designed to provide for the monitoring and protection of the species and maintenance of its habitat at Andrews AFB. The species was first documented in 1993. An 1995 assessment for the species identified potential habitat northeast of Base Lake in the vicinity of the golf course. Based on discussions with the natural resource manager at the base, the species was identified and photographed at this location in 2002. The habitat is currently protected by fencing and signage that warns of the presence of a protected species.

2.1 Sandplain Gerardia Management Issues and Concerns

Sandplain gerardia is a very threatened species throughout its range (Cape Cod, Massachusetts, Long Island, New York, Rhode Island, and Maryland). The species has been directly exploited or threatened by natural or man-made forces. The most serious threats to sandplain gerardia populations appear to be habitat destruction and habitat loss due to succession. In Maryland, natural succession by woody perennials has occurred. Fire and subsequent invasion of Virginia pine also has resulted in population declines throughout the plant's range. Sandplain gerardia populations have also faltered in areas of seemingly suitable habitat. Reasons for decline are unknown, but it has been posited that it is related to natural population fluctuations, absence of vegetative reproduction, inefficient pollination, herbivory, or lack of disturbance from grazing and burning.

Sandplain gerardia populations vary widely between years at any given site and appear to require periodic disturbance. The species is often out-competed by other species.

Habitat Needs for the Species Include:

- **Native Grassland Vegetation** - Total vegetation cover (70-95%) of primarily low-growing native plant species, especially little bluestem but also Indian grass. Little or no shading from shrubs or trees.
- **Soil -** Sandy loam, loam, or silt loam, or (in Maryland) loamy sand.
- **Micro-Habitat -** Small openings in vegetation is optimal, exposing mineral soil with little organic litter or duff on the soil surface.
- **Protection from Browsers** - If rabbit populations are dense, fencing may be required. (The Nature Conservancy, 1995)

The site of the Andrews AFB sandplain gerardia population is currently fenced and includes native grassland vegetation and appropriate soils. However, the herbaceous layer lacks openings where competition is reduced. In addition, the area is succeeding to shrub and sapling growth. The population has been observed as recently as 2002 but is likely to be suffering due to natural succession. Maintenance of open habitat appears to be essential to most populations of sandplain gerardia. It is likely that a seed

bank does exist at the site, and that the species would respond favorably to management practices, including a disturbance regime and annual monitoring during the blooming period.

2.2 Sandplain Gerardia Management Goals and Objectives

Goal #1 – Design and Implement an Appropriate Annual Monitoring Plan

Objectives:

1. Design an appropriate annual monitoring plan.
2. During the flowering and fruiting period from late August to early September, count numbers of sandplain gerardia and document the condition and distribution of the plants.

An appropriate monitoring plan should be developed with input from USFWS, MDNHP and the managers of other sandplain gerardia populations in Maryland. This species is difficult to impossible to identify outside of the blooming period. Of extreme importance is conducting the monitoring while the plants are actually blooming, and during the appropriate time of day. Flowers open in the morning and are pollinated. Once pollination occurs, the petals may drop off making the plants difficult or impossible to identify (M Jordan 2004). Coordination with managers of other populations may be useful in providing an alert to blooming time of local populations each year. Local experts may also provide training and/or assistance for base monitoring.

Goal #2 – Evaluate the Results of the Monitoring to Determine the Status and Condition of the Population

Goal #3 – Evaluate and Implement Alternative Management Strategies that Would Favor Restoration/Enhancement of the Sandplain Gerardia Population.

Potential Objective

1. Introduce an appropriate disturbance regime.

Appropriate management strategies should be developed. Management that maintains native grassland habitat with some exposed soil, and prevents succession to brush and trees may be accomplished through various approaches, including:

- Fire (preferred option)
- Mowing (in dormant season, December through April) followed by raking up and removing the cut plant material.
- Removal of non-native turf grasses and other invasive or tall plants that could compete with, or overgrow and shade out *A. acuta (*hand-weeding or herbicide; possibly appropriate grazing or biocontrol).
- Brush removal (mechanical or herbicide)

Management and monitoring activities to be implemented throughout the year are included in Table 1.

Table 1
Management and Monitoring Activities

Season	***Activity***
Dormant season (December-to the end of April)	Cut to the base all woody vegetation
	Remove all cute brush from the site
	Rake up and remove dead plant litter from the soil surface
	Do not remove soil that could contain *A. acuta* seeds
Growing season (late-August to early September)	Count number of *A. acuta* when blooming in the morning; petals fall after pollination, usually mid-day.
	Note any browse or drought damage
	Maintain existing protective fencing
Mature seeding period (late-October to mid-November)	If *A. acuta* plants appear and set seed, but plants are restricted to small areas, collect and spread seed to new locations.
	Collect seed from *A. acuta* on dry, calm days in November. Remove no more than 20% of seeds/capsules. Collect only dry, brown, ripe capsules.
Mature seeding period (late-October to mid-November)	Allow capsules to air-dry in an open vial indoors (capsules are often damp when collected).
	Gently crush capsules with fingers or pencil eraser. Chaff can be removed with a fine sieve, and seeds may be examined for soundness and condition with a dissecting microscope or hand lens, but this is not essential.
	Distribute seed in the cleared and prepared areas of good habitat. Seeds should be scattered around the edges of, and between, clumps of little bluestem grass (or Indian grass) on bare mineral soil.

Source: TNC, 1995

Additional input may be obtained from USFWS, MDNHP and the managers of other sandplain gerardia populations in Maryland. Of primary and immediate importance is the removal of shrub and sapling growth within the enclosure and retardation of re-growth of these and other species not associated with native grassland communities. Care should be taken to retain as much of the soil as possible, thereby retaining the seedbank, while removing these species.

2.3 Sandplain Gerardia Work Plan for Years Two Through Five

Goal #1 – Continue Monitoring of Sandplain Gerardia and Associated Habitat to Document Species Occurrence and Condition

Goal #2 – Evaluate and the Results of Monitoring and Management Strategies and Design

and Implement Changes as Required

Goal #3 – Evaluate and Implement Alternative Management Strategies that Would Favor Restoration/Enhancement of the Sandplain Gerardia Population

Potential Objectives

1. Continue appropriate disturbance regime.
2. Expand the population within the existing enclosure. If sandplain gerardia plants appear and set seed, sow available seeds in other areas of appropriate habitat.

For Years Two through Five the disturbance regime should be continued. It should be noted that sandplain populations vary widely from year to year so fluctuations over this period should not automatically be assumed to result from management activities.

If sandplain gerardia plants appear and set seed, Andrews AFB could collect and spread seed to new locations within the enclosure. Collection and sowing suggestions were previously included in Table 6-1. Collaboration with local population managers in Maryland and relevant agencies is recommended.

References

The Nature Conservancy (TNC). 1995. *Species and Natural Communities of Concert on US Air Force Lands: An Installation Specific Handbook for Andrews Air Force Base*. (Pilot Project).

Appendix E. Correspondence with the USFWS and MD DNR

15.0 ASSOCIATED PLANS

1. Installation Development Plan for JBA (JBA, 2016a)
2. JBA Instruction 91-212: *Bird/Wildlife Strike Hazard (BASH) Program* (JBA, 2014a)
3. Integrated Pest Management Plan (IPMP; JBA, 2018a)
4. JBA Arbor Plan (JBA, 2011)
5. Stormwater Pollution Prevention Plan for JBA (SWPPP; JBA, 2015a)
6. USAF Stormwater Management Plan for JBA (JBA, 2017a)
7. Air Installation Compatible Use Zone (AICUZ) Study (JBA, 2017b)
8. Installation Complex Encroachment Management Action Plan (ICEMAP; JBA, 2012)
9. Joint Land Use Study (JLUS; MNCPPC, 2009)
10. JBA Installation Emergency Management Plan (JBA, 2013)
11. USAF Integrated Solid Waste Management Plan for JBA (JBA, 2018)
12. Hazardous Waste Management Plan, 316th Wing, Joint Base Andrews Naval Air Facility Washington, Maryland (JBA, 2016b)
13. Spill Prevention, Control, and Countermeasures Plan for JBA (JBA, 2015b)
14. Integrated Cultural Resources Management Plan for Andrews Air Force Base, Maryland (ICRMP; JBA, 2014c)