INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. Army Aberdeen Proving Ground – Aberdeen Area and Edgewood Area

Update
November 2021

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Integrated Natural Resources Management Plan:
U.S. Army Aberdeen Proving Ground
(Update November 2018)

Tripartite Agreement (1 of 3)

This Integrated Natural Resources Management Plan was developed by the U.S. Army Aberdeen Proving Ground, in cooperation with the U.S. Fish and Wildlife Service and the Maryland Department of Natural Resources. This Integrated Natural Resources Management Plan was subsequently reviewed for operation and effect (and updated appropriately), as summarized in the attached Memorandum for Record. This Integrated Natural Resources Management Plan continues to meet the requirements of the Sikes Act Improvement Act (16 USC 670 et seq, as amended). The signatures below indicate plan approval and continued mutual agreement regarding the cooperative advancement of a fully-integrated ecosystem-based natural resources management program on the installation.

Plan Approval:

Robert L. Phillips — March 8, 2019

Robert L. Phillips
Colonel, U.S. Army
Commander, U.S. Army Garrison
Aberdeen Proving Ground, Maryland

Date

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Integrated Natural Resources Management Plan:
U.S. Army Aberdeen Proving Ground
(Update November 2018)

Tripartite Agreement (2 of 3)

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Agency Agreement:

Genevieve LaRouche — Date: Apr. 14, 2019

Supervisor, Chesapeake Bay Ecological Services Field Office
U.S. Fish and Wildlife Service

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Integrated Natural Resources Management Plan:
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Agency Agreement:

1/7/19

Paul A. Peditto
Director, Wildlife and Heritage Service
Maryland Department of Natural Resources

Date

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
ACUB	Army Compatible Use Buffer
APG	Aberdeen Proving Ground
APGR	Aberdeen Proving Ground Regulation
APZ	accident potential zone
AR	Army Regulation
ARL	United States Army Research Laboratory
ATC	United States Aberdeen Test Center
ATEF	Automotive Technology Evaluation Facility
AT/FP	anti-terrorism/force protection
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
C5ISR	Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance
CBC	Chemical Biological Center
CESU	Cooperative Ecosystem Studies Units
CFR	Code of Federal Regulations
CZ	clear zone
DFMWR	Directorate of Family and Morale, Welfare and Recreation
DoD	Department of Defense
DoO	Directorate of Operations
DPW	Directorate of Public Works
EA	environmental assessment
EIS	environmental impact statement
EMS	environmental management system
EO	Executive Order
EOD	explosive ordnance disposal
EQCC	Environmental Quality Control Committee
ESTCP	Environmental Security Technology Certification Program
EUL	enhanced use lease
FIDS	forest interior dwelling species
FLETC	Federal Law Enforcement Training Center
FLIR	forward looking infrared
FONSI	finding of no significant impact
FY	fiscal year
GATE	Government and Technology Enterprise

GERB	Garrison Environmental Requirements Build
GIS	geographic information system
HERF	hazards of electromagnetic radiation to fuel
HERO	hazards of electromagnetic radiation to ordnance
HERP	hazards of electromagnetic radiation to personnel
HIC	hunter-in-charge
HQDA	Headquarters, Department of the Army
IMCOM	Installation Management Command
INRMP	Integrated Natural Resources Management Plan
ITAM	Integrated Training Area Management
JLUS	Joint Land Use Study
LID	low impact development
LMPT	Land Management Police Training
LTB	long-term benthic
MDARNG	Maryland Army National Guard
MDDNR	Maryland Department of Natural Resources
MDE	Maryland Department of the Environment
MDEP	Management Decision Package
MHT	Maryland Historical Trust
MOA	memorandum of agreement
MOU	memorandum of understanding
mph	miles per hour
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OEA	Office of Economic Adjustment
OMA	Operations and Maintenance Army
ORISE	Oak Ridge Institute of Science and Education
PAAF	Phillips Army Airfield
PIF	Partners in Flight
POM	Program Objective Memorandum
psu	practical salinity unit
RDT&E	Research, Development, Test and Evaluation
REC	record of environmental consideration
REPI	Readiness and Environmental Protection Initiative
RPMP	Real Property Master Plan

SAV	submerged aquatic vegetation
SERDP	Strategic Environmental Research and Development Program
SHPO	State Historic Preservation Office
SRM	Sustainment, Restoration and Modernization
SWAP	state wildlife action plan
TMDL	total maximum daily load
U.S.	United States
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
VIMS	Virginia Institute of Marine Sciences
WAH	Weide Army Heliport
WASH	wildlife aircraft strike hazard
WIP	watershed implementation plan

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1. OVERVIEW

1.1 AUTHORITY AND LEGAL REQUIREMENTS

Military lands and waters contain some of our nation's most significant remaining large tracts of land with valuable natural resources. The Sikes Act Improvement Act, as amended in 16 USC 670a-670o (herein referred to as Sikes Act), requires the Secretary of each military department to prepare and implement an Integrated Natural Resources Management Plan (INRMP) for each military installation in the United States (U.S.) with significant natural resources. The INRMP guides installation personnel in the conservation and rehabilitation of natural resources in support of mission sustainability; the sustainable multipurpose use of the natural resources (hunting, fishing, trapping, forest products, and non-consumptive uses); and the accommodation of public access to facilitate the use of the natural resources (subject to safety requirements and military security).

This INRMP is prepared for use at the U.S. Army Aberdeen Proving Ground (APG) – Aberdeen Area and Edgewood Area, including the non-contiguous properties in Baltimore, Harford and Kent Counties, Maryland (identified in Section 2.1). This INRMP does not cover Adelphi Laboratory Center and Blossom Point Research Facility which are sub-installations of APG located in Montgomery, Prince George's and Charles Counties, Maryland. The INRMP for Adelphi Laboratory Center and Blossom Point Research Facility is currently a separate document (ALC 2014).

This INRMP has been prepared in accordance with the Sikes Act, and with reference to the following laws, regulations, policies, agreements, and guidance listed below:

Department of Defense (DoD) Instructions, Manuals, Policies, and Regulations:

- DoDI 4715.03, Natural Resources Conservation Program, March 2011
- DoDI 5525.17, Conservation Law Enforcement Program, October 2013
- DoDM 4715.03, INRMP Implementation Manual, November 2013
- DoD Policy to Use Pollinator-Friendly Management Prescriptions, September 2014
- DoD FMR 7000.14-R, Department of Defense Financial Management Regulation

Department of the Army Regulations (ARs), Directives, and Implementing Guidance:

- AR 200-1, Environmental Protection and Enhancement
- Army Directive 2020-08, U.S. Army Installation Policy to Address Threats Caused by Changing Climate and Extreme Weather
- Memorandum – Army Policy Guidance for Fish and Wildlife Conservation Fund, 21X5095 (January 2002)

APG Regulations (APGRs) and Policies:

- APGR 200-6, Recreational Hunting and Trapping
- APGR 200-7, Source Water Protection Area Management Strategies

- APGR 200-40, Environmental Quality
- APGR 200-41, Water Quality Management
- APGR 200-62, Reforestation
- APGR 200-63, Sale of Firewood
- APGR 200-64, Eagle Management
- APGR 210-10, Use and Navigation of Restricted Waters and Control of Commercial Fishing and Crabbing
- APGR 210-26, Recreational (Non-Commercial) Fishing Rules
- APG Policy – Coordinating Environmental Issues with Federal, State and/or Local Officials

Federal Laws, Executive Orders (EOs), and Presidential Memorandums:

- Sikes Act, 16 U.S. Code (USC) 670a-670o
- Bald and Golden Eagle Protection Act, 16 USC 668-668c
- Clean Water Act of 1977, Section 404, 33 USC 12.51 et seq.
- Coastal Zone Management Act of 1972, 16 USC 1451-1464
- Endangered Species Act of 1973, 16 USC 1534
- EO 11988 – Floodplain Management
- EO 11990 – Protection of Wetlands
- EO 12088 – Federal Compliance with Pollution Control Standards
- EO 12962 – Recreational Fisheries
- EO 13112 – Invasive Species
- EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13508 – Chesapeake Bay Protection and Restoration
- EO 13514 – Federal Leadership in Environmental, Energy, and Economic Performance
- EO 14008 – Tackling the Climate Crisis at Home and Abroad
- Federal Insecticide, Fungicide and Rodenticide Act
- Federal Property and Administrative Act of 1949
- Fish and Wildlife Conservation Act of 1958, 16 USC 611
- Lacey Act
- Migratory Bird Treaty Act, 16 USC 703 et seq, and as amended
- National Environmental Policy Act of 1969, 42 USC 4321-4361
- Presidential Memorandum – Incorporating Ecosystem Services into Federal Decision Making (October 2015)
- Presidential Memorandum – Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators (June 2014)
- Rivers and Harbors Act
- Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (October 2000)
- 10 USC 2684A, Agreements to Limit Encroachments and Other Constraints on Military Training, Testing, and Operations
- 10 USC 2665, Sale of Certain Interests in Land; Logs
- 10 USC 2667, Leases: Non-Excess Property of Military Departments and Defense Agencies

Maryland State Laws and Enforceable Policies:

- Maryland Enforceable Coastal Policies, April 2011
- Maryland Stormwater Management and Erosion and Sediment Control Guidelines for State and Federal Projects, February 2015
- Erosion and Sediment Control, Code of Maryland Regulations 26.17.01
- Endangered Species of Fish Conservation Act, Annotated Code of Maryland, Natural Resources Article, Title 4-2A
- Nongame and Endangered Species Conservation Act, Annotated Code of Maryland, Natural Resources Article, Title 10-2A
- Nontidal Wetlands Protection Act, Annotated Code of Maryland, Environment Article, Title 5-901(h)(1)
- Tidal Wetlands Protection Act, Annotated Code of Maryland, Environment Article, Title 16-101(n)
- Stormwater Management Regulations, Code of Maryland Regulations 26.17.02

Other Stakeholder Agreements:

- Chesapeake Bay Watershed Agreement, 2014 (Chesapeake Bay Commission, States, other agencies, and DoD)
- Memorandum of Agreement (MOA) – Forest Mitigation Strategy, 2011 (Maryland Critical Area Commission, Maryland Department of Natural Resources Forest Service, and APG)
- Memorandum of Understanding (MOU) – Conservation and Management of Pollinators, Their Habitats, and Associated Ecosystems, 2015 (Pollinator Partnership and DoD)
- MOU – Conservation of Migratory Birds, 2014 (U.S. Fish and Wildlife Service and DoD)
- MOU – Cooperative Integrated Natural Resource Management Program on Military Installations, 2013 (U.S. Fish and Wildlife Service, Association of Fish and Wildlife Agencies, and DoD)
- MOU – Federal Consistency Requirements of Coastal Zone Management Act, 2013 (State of Maryland and DoD)
- MOU – Watchable Wildlife, 1990 (Department of the Army, other departments, and organizations)
- Mutual DoD and USFWS Guidelines for Streamlined Review of INRMP Updates, July 2015 (USFWS and DoD)

1.2 SCOPE

An INRMP is an extremely important management tool that ensures military operations and natural resources conservation are integrated and consistent with stewardship and legal requirements. This INRMP describes the natural resources on APG, their relationship with the military mission, and provides strategies for natural resources management that facilitate mission sustainability while maintaining ecosystem viability. The INRMP covers a five-year period, but considers longer range outlooks when developing management strategies. Natural resources include both earth resources (non-living resources such as minerals and soil) and biological resources (living

resources such as plants and animals). This INRMP covers all lands and waters within the boundaries of APG.

1.3 RESPONSIBILITIES

The development of this INRMP is a collaborative effort between individuals and organizations that have a vested interest in natural resources management on the installation. The successful implementation of an INRMP relies on strong collaboration and communication between these internal and external stakeholders.

1.3.1 Internal INRMP Stakeholders

Internal stakeholders are those persons or groups on APG that are involved directly or indirectly with natural resources management on APG.

1.3.1.1 Garrison Commander

The Garrison Commander is ultimately responsible for all aspects of installation operations at APG including the implementation of this INRMP. Acting through subordinates, the Garrison Commander is responsible for:

- Planning land utilization to avoid or minimize adverse effects on environmental quality and provide for the sustainability of the mission and environment
- Funding and staffing of natural resources management professionals and other resources required to effectively manage natural resources on the installation
- Ensuring all installation land users are aware of and comply with procedures and requirements necessary to accomplish objectives of this INRMP together with environmental laws, regulations, policies, and other measures
- Entering into appropriate cooperative plans (16 USC 670a) and agreements with state, federal, and other entities related to natural resources management
- Chairing and ensuring the function of the APG Environmental Quality Control Committee (EQCC) which is convened quarterly

1.3.1.2 Directorate of Public Works – Environmental Division – Natural Resources Team

The Directorate of Public Works (DPW) maintains an Environmental Division which is responsible for the environmental programs at APG including the management of compliance operations, hazardous waste, environmental restoration, and cultural and natural resources. Cultural resources and natural resources staff (teams) are combined into the Environmental Integration Branch. Natural resources programs managed by the Natural Resources Team include, but are not limited to:

- Army Compatible Use Buffer
- Chesapeake Bay Program
- Fish Communities
- Flora
- Submerged Aquatic Vegetation
- Bald Eagles
- Fauna (Game and Non-Game)
- Firewood Sales
- Forest Management
- Threatened and Endangered Species

- Wetlands and Floodplain

The natural resources responsibilities of the Natural Resources Team include:

- Preparing and facilitating implementation of this INRMP
- Ensuring coordination of the natural resources programs with all installation land users to support the mission and to responsibly manage natural resources
- Serving as single point of contact for all communication with local, state, and federal governmental and non-governmental organizations relative to natural resources management programs, projects, and operations on APG
- Reviewing all environmental documents, project proposals, and other plans to ensure natural resources are adequately considered and/or management is implemented
- Identifying issues and making recommendations for the enhancement and management of natural resources
- Developing and implementing programs to ensure the inventory, delineation, classification, monitoring, and management of all natural resources
- Ensuring the installation commander is informed regarding natural resources issues which may impact the mission and/or result in a violation of laws, policies, or regulations
- Convening and chairing the Conservation Subcommittee of the EQCC
- Setting seasons and bag limits for recreational hunting program
- Execution of Army Fish and Wildlife Conservation funds (21X5095) for the protection, conservation, and management of APG fish and wildlife including habitat improvement and related activities

1.3.1.3 Directorate of Operations

The Directorate of Operations (DoO) is responsible for fire protection and prevention, and police activities on APG. The Garrison Commander designated the APG Fire Chief as the APG Wildland Fire Program Manager. The Fire Chief is responsible for the APG Integrated Wildland Fire Management Plan, with input from the Natural Resources Team. The DoO has a full-time Conservation Law Enforcement Branch. The Conservation Law Enforcement Officers are specially trained and delegated the authority to enforce all local, state, and federal laws and regulations pertaining to APG's natural and cultural resources. The Conservation Law Enforcement Officers work closely with the DPW Natural Resources Team, and provide invaluable support and services to the management of APG's natural and cultural resources. With respect to this INRMP, the Conservation Law Enforcement Officers are responsible for:

- Enforcing natural resource laws and regulations
- Providing specialized law enforcement expertise regarding natural resource matters

1.3.1.4 Directorate of Family and Morale, Welfare and Recreation

The Directorate of Family and Morale, Welfare and Recreation (DFMWR) is responsible for a variety of quality of life concerns, including recreational activities, for Soldiers, Families, Civilians, and Retirees. APG's recreational hunting and fishing programs are administered by the DFMWR Outdoor Recreation staff. With respect to this INRMP, the DFMWR is responsible for:

- Providing outdoor recreational opportunities for installation users and the surrounding community, when compatible with military mission
- Selling of APG recreational hunting and fishing permits, collection of activity fee, and depositing of fees
- Transferring of funds (less up to ten percent for administration costs) from sale of APG recreational hunting and fishing permits to Army Fish and Wildlife Conservation fund (21X5095)

1.3.1.5 Other Garrison Organizations

Implementation of this INRMP requires assistance and support from other Garrison directorates and offices. Such organizations include:

1. **DPW – Environmental Division – Compliance Branch**

   The DPW Environmental Division, Compliance Branch is responsible for numerous environmental compliance programs including air quality, water, pollution prevention, solid waste, recycling, radiological, petroleum/oils/lubricants, soil, and hazardous materials. With regards to INRMP implementation, the Compliance Branch manages the soil, sediment and erosion control, and stormwater programs, all of which contribute significantly to the health of the installation's natural resources and ecosystems.

2. **DPW – Operations and Maintenance Division – Roads and Grounds Branch**

   The DPW Operations and Maintenance Division includes the Roads and Grounds Branch which is responsible for the maintenance and improvement of the grounds, landscaping, and roads on APG. The Roads and Grounds Branch assists in many natural resources projects including the installation of bird nesting platforms, installation of signage, removal of beaver dams, and maintenance of stormwater facilities.

3. **DPW – Operations and Maintenance Division – Integrated Pest Management Coordinator**

   Pest management on APG focuses primarily on disease vectors, household pests, some vertebrate pests, and some invasive and/or nuisance species. The Integrated Pest Management Coordinator coordinates all chemical pesticide and herbicide use on the installation, including aerial herbicidal spraying, and is responsible for the APG Integrated Pest Management Plan.

4. DPW – Master Planning Division

The DPW Master Planning Division is responsible for real property, leases, re-use, geographic information system (GIS) support, and assisting in the administration of encroachment programs. These functions require coordination with the DPW Natural Resources Team regarding the siting, planning, and construction (or demolition) of facilities and other infrastructure. The Master Planning Division is responsible for the APG Real Property Master Plan. The GIS office is responsible for maintaining the data layers pertaining to natural resources management in an Army standardized format, using the data supplied by the DPW Natural Resources Team.

5. Staff Judge Advocate

The Staff Judge Advocate provides legal advice, counsel, and services to Command, staff, and subordinate elements of APG including legal review of environmental issues.

1.3.1.6 Tenants

APG is home to 18 major commands and supports more than 80 tenants, 20 satellite and 17 private activities. With few exceptions, tenant activities have the potential to directly or indirectly impact the natural resources at APG. The primary land users at APG (based on acreage and/or potential for impacts to natural resources) are listed below alphabetically:

- **Aberdeen Test Center (ATC)**

  ATC is under the U.S. Army Test and Evaluation Command. ATC's major missions include automotive testing of wheeled and tracked vehicles; firepower; survivability/lethality; testing of soldier systems and support equipment; military environmental technologies; and maritime systems. Their facilities and range areas include automotive test courses, firing ranges, impact areas, instrumentation and simulation facilities, and a meteorology facility. The Commander of ATC is the Range Officer in Charge for APG. ATC provides control and coordination for range operations on APG land, water, and restricted airspace. ATC is a Major Range and Test Facility Base, a national asset (DoD Directive 3200.11) and the only one in a temperate climate. ATC is an Army Center of Excellence for Live Fire Testing; DoD Center of Excellence for Body Armor Testing; Lead DoD Test Center for Direct Fire Testing; Lead DoD Test Center for Land Combat Systems; and Designated DoD Personal Protective Equipment Tester.

- **Communications-Electronics, Research, Development and Engineering Center (CERDEC)**

  CERDEC is an Army applied research center under the U.S. Army Combat Capabilities Development Command. CERDEC develops, engineers, and foresees essential Army needs in mission command and intelligence

technologies, applications, and networks designed to connect and protect the Soldier.

- **Chemical Biological Center (CBC)**

  CBC is under the U.S. Army Combat Capabilities Development Command. CBC provides integrated science, technology and engineering solutions to address chemical and biological vulnerabilities. Their facilities and range areas are used to conduct research, demonstrations, validations, and engineering manufacturing development toward the production of chemical defense systems, obscuring smoke, aerosol systems, and flame weapons.

- **Maryland Army National Guard (MDARNG)**

  The Maryland Military Department mans, equips, trains, and deploys National Guard units in support of missions directed by the President of the United States and to support state responses to any major emergency or disaster. The MDARNG 29th Combat Aviation Brigade is headquartered at APG's Edgewood Area and provides command and control to a variety of aviation and other units. It is the major aviation command within the MDARNG, containing units from across the nation. The MDARNG operates the Weide airfield which serves as a primary Army Aviation Support Facility. The MDARNG utilizes standardized flight patterns for rotary-wing training operations within APG's airspace. MDARNG also utilizes the Lauderick Creek training area for soldier training (both ground and aerial maneuvers).

- **U.S. Army Communications-Electronics Command (CECOM)**

  CECOM ensures the global readiness of the Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance Materiel (C5ISR) systems and the information and technology for troops to communicate on the battlefield. CECOM provides training; field support for software modifications and software upgrades; logistics expertise; information assurance; joint network capabilities; and interoperability certification functions.

- **U.S. Army Research Laboratory (ARL)**

  ARL is the Army's central laboratory under the U.S. Army Combat Capabilities Development Command. ARL's program consists of basic and applied research and survivability/lethality and human factors analysis that provide enabling technologies to many of the Army's most important weapon systems. ARL's testing includes improvised explosive device threat mitigation, insensitive munitions research, and vehicle survivability and lethality conducted on multiple outdoor and indoor range areas.

With respect to this INRMP, tenants are responsible for:

- Coordinating with DPW Natural Resources Team to ensure mission activities are conducted in accordance with natural resource laws and regulations
- Providing input to and review of the INRMP
- Participating in the EQCC
- Participating in the Conservation Subcommittee of the EQCC

1.3.2 External INRMP Stakeholders

In accordance with the Sikes Act, APG is required to prepare, maintain, and implement an INRMP in coordination with the U.S. Fish and Wildlife Service (USFWS), appropriate State fish and wildlife agencies, and when relevant, the National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA Fisheries). This tri-party coordination is formalized in the 2013 MOU between the DoD, the USFWS, and the Association of Fish and Wildlife Agencies.

The USFWS provides signatory agreement concerning the conservation, protection, and management of the fish and wildlife resources presented in the INRMP. The USFWS is the primary federal agency for issues regarding fish and wildlife management, as well as the regulatory authority for federally-listed threatened and endangered species, migratory birds, and bald and golden eagles. As of June 2009, the USFWS signature authority for INRMPs is delegated to their field offices (2015 USFWS). The field office is the DoD installation's point of contact for developing and reviewing the INRMP. The field offices coordinate appropriately with their USFWS regional office. APG coordinates with the USFWS's Chesapeake Bay Ecological Services Field Office.

The Maryland Department of Natural Resources (MDDNR) provides State signatory agreement concerning the conservation, protection, and management of the fish and wildlife resources presented in the INRMP. The MDDNR leads Maryland's Chesapeake Bay Program; oversees Maryland's public lands; regulates hunting, trapping and fishing; regulates the conservation of rare plants and animals in the state; manages the health and recreational use of Maryland's freshwater and saltwater finfish and shellfish; enforces natural resources laws (including fishing, hunting, trapping, boating, water pollution, and wildlife conservation); offers incentive programs and technical assistance for forest management; and conducts natural resources education programs. The MDDNR is the state trustee agency with jurisdiction by law over the fish and wildlife on APG. APG coordinates with the Wildlife and Natural Heritage Service of MDDNR for developing and reviewing the INRMP.

The NOAA Fisheries provides guidance concerning the conservation, protection, and management of off-shore living marine resources and their habitats. APG coordinates with the NOAA Fisheries in developing installation management strategies for the Atlantic and shortnose sturgeons which are federally-listed endangered species.

1.4 POLICIES, GOALS, AND OBJECTIVES

In accordance with DoDI 4715.03, it is DoD policy that "the principal purpose of DoD lands, waters, airspace, and coastal resources is to support mission-related activities. All DoD natural resources conservation program activities shall work to guarantee DoD continued access to its land, air, and water resources for realistic military training and testing and to sustain the long-term ecological integrity of the resource base and the ecosystem services it provides."

The principal function of natural resources management at APG is to support no net loss in military mission capability, while enhancing testing and training capabilities to the maximum extent practicable, and meeting legal requirements. The goals of APG's INRMP are listed below.

Goal 1: Manage the natural resources to sustain realistic testing and training environments for APG's military mission

Objective 1.1 – Conduct comprehensive planning and risk management to avoid or mitigate constraints and restrictions from encroachment

Objective 1.2 – Sustain mission lands through management, monitoring, research, and rehabilitation

Goal 2: Demonstrate sustainable stewardship of natural resources by protecting and enhancing those resources in compliance with legal requirements

Objective 2.1 – Manage natural resources in compliance with environmental laws such as the Sikes Act, Endangered Species Act, Clean Water Act, Coastal Zone Management Act, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act

Objective 2.2 – Conserve threatened and endangered species in compliance with federal, DoD, and Army regulations and policies

Objective 2.3 – Use adaptive management strategies to conserve and enhance native fauna and flora, and manage or eliminate invasive species

Objective 2.4 – Monitor soils, waters, wetlands, vegetation, and wildlife and apply ecosystem-based management principles

Objective 2.5 – Comply with National Environmental Policy Act to make informed decisions

Objective 2.6 – Support professional development of natural resources professionals

Goal 3: Manage natural resources for multiple uses when appropriate, including sustainable yield of renewable resources, scientific research, education, and recreation

Objective 3.1 – Provide renewable natural resource products when such products can be produced in a manner that sustains the military mission and natural resources

Objective 3.2 – Provide outdoor recreational opportunities such as hunting, fishing, trapping, crabbing, etc. when compatible with military mission and management of natural resources

Objective 3.3 – Provide educational outreach activities for installation users and the surrounding community

1.5 OVERALL MANAGEMENT STRATEGY

The Army is a trustee of the nation's natural resources. Natural resource management and conservation at APG is a complex task which must reconcile competing demands. DoD natural resource management must result in sustainable habitats for realistic military testing and training, comply with legal requirements, and promote multiple uses of the installation's lands and waters.

The foundation of this INRMP is ecosystem-based management. An ecosystem-based management approach ensures that all aspects of the ecosystem are considered, not just those directly related to an activity. Ecosystem-based management maintains and improves the sustainability and native biodiversity of ecosystems. As stated in DoDI 4715.03, ecosystem-based management will:

1. Avoid single-species management and instead implement a multiple species management approach (while complying with the Endangered Species Act),
2. Use adaptive management
3. Engage in local or regional partnerships
4. Use best available scientific information in decision making
5. Foster long-term sustainability of ecosystem services

An ecosystem service is any positive benefit that natural resources, as an integrated whole, provide to humans. The benefits can be direct or indirect, and small or large. The Millennium Ecosystem Assessment, a major United Nations sponsored effort to analyze the impact of human actions on ecosystems and human well-being, identifies four major categories of ecosystem services, as defined below.

- **Provisioning Service**

  A provisioning service is any type of benefit to humans that can be extracted from the ecosystem. At APG, these services include timber and firewood, along with fish and crabs from recreational and commercial fishing/crabbing.

- **Regulating Service**

  A regulating service is the benefit provided by ecosystem processes that moderate natural phenomena. At APG, these services include water purification, erosion and flood control, carbon storage, and pollination.

- **Cultural Service**

  A cultural service is a non-material benefit, such as mental and physical health and recreation. At APG, these services include fishing, boating, hunting, wildlife viewing, and other recreational opportunities.

- **Supporting Service**

  A supporting service is a benefit that is needed for the success of all other ecosystem services. The most basic supporting services are photosynthesis, nutrient cycling, soil formation, and water cycling.

1.5.1 Management Areas

For the purposes of planning and implementing projects, this INRMP divides APG into 19 management areas. These areas are generally delineated by land use, mission use, and watershed. The management areas are described further in Section 2.1.1.

1.5.2 Planning Level Surveys

Ecosystem-based management, planning, and decision-making relies on accurate surveys, inventories, and evaluations of the natural resources. Planning level surveys (PLSs) are used to identify and evaluate the condition and trends of wetlands; freshwater, marine and estuarine waters; forests; grasslands; soils; threatened and endangered species; and any other significant environmental elements. PLSs are required and conducted in accordance with AR 200-1. As stated in AR 200-1, PLSs should be kept current according to the installation's specific needs, but at a minimum, be reviewed and updated if necessary prior to the INRMP's revision. PLSs include as a minimum:

- Topography/Bathymetry
- Soils
- Surface Waters
- Wetlands
- Flora (vascular plants)
- Vegetation Communities
- Fauna (mammals, birds, amphibians, reptiles, insects)
- Threatened and Endangered Species

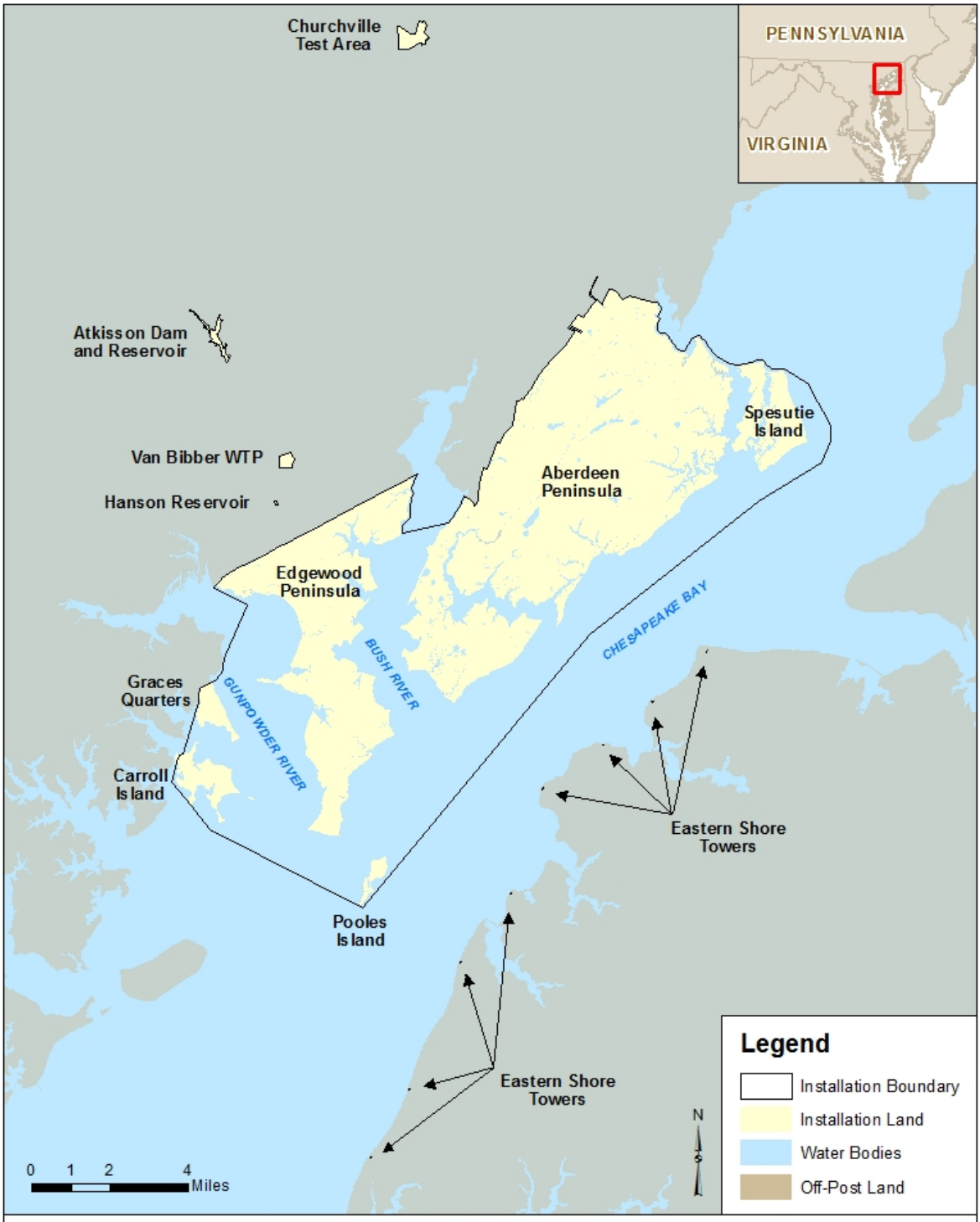
2. INSTALLATION INFORMATION

2.1 GENERAL DESCRIPTION

APG occupies approximately 72,283 acres and is located on the western shore of the northern Chesapeake Bay in Maryland. The installation lies approximately 20 miles northeast of the city of Baltimore. The installation is geographically divided into two areas, separated by the Bush River. The Edgewood Area is to the west of the river, and the Aberdeen Area lies to the east (Figure 2-1). The Edgewood Area is approximately 11,731 acres and consists of the Edgewood peninsula, Pooles Island, Graces Quarters, and Carroll Island. The Aberdeen Area is approximately 29,843 acres and consists of the Aberdeen peninsula and Spesutie Island. APG also includes several smaller non-contiguous properties: Churchville Test Area, Atkisson Dam and Reservoir, Van Bibber Water Treatment Plant and Hanson Reservoir, and Eastern Shore Towers. All of APG lands lie in Harford County, Maryland except for Carroll Island and Graces Quarters which lie in Baltimore County, and the Eastern Shore Towers which are located in Kent County. Nearly half of APG's total acreage is open water including numerous tidal and non-tidal creeks. Portions of the Chesapeake Bay and two estuarine rivers (Gunpowder River and Bush River) alone make up approximately 30,276 acres of open water. The major land and water areas and acreages of APG are summarized in Table 2-1.

Table 2-1. Major Land and Water Areas of APG

Area	Acres
Harford County:	
Edgewood Peninsula	10,260
Pooles Island	209
Aberdeen Peninsula	27,553
Spesutie Island	2,290
Churchville Test Area	221
Atkisson Dam and Reservoir	126
Van Bibber Water Treatment Plant and Hanson Reservoir	81
Baltimore County:	
Graces Quarters	466
Carroll Island	796
Kent County:	
Eastern Shore Towers	5
Gunpowder River, Bush River, and Chesapeake Bay	30,276
Total:	**72,283**



ABERDEEN PROVING GROUND, MARYLAND

Figure 2-1 Major Land and Water Areas

2.1.1 INRMP Management Areas

As stated previously in Section 1.5.1, this INRMP divides APG into 19 management areas for the purposes of planning and implementing projects on an ecosystem-based level. These management areas are generally delineated by land use and mission use. The management areas are shown in Figure 2-2, and are briefly described below.

Aberdeen Area:

- **Aberdeen Cantonment**

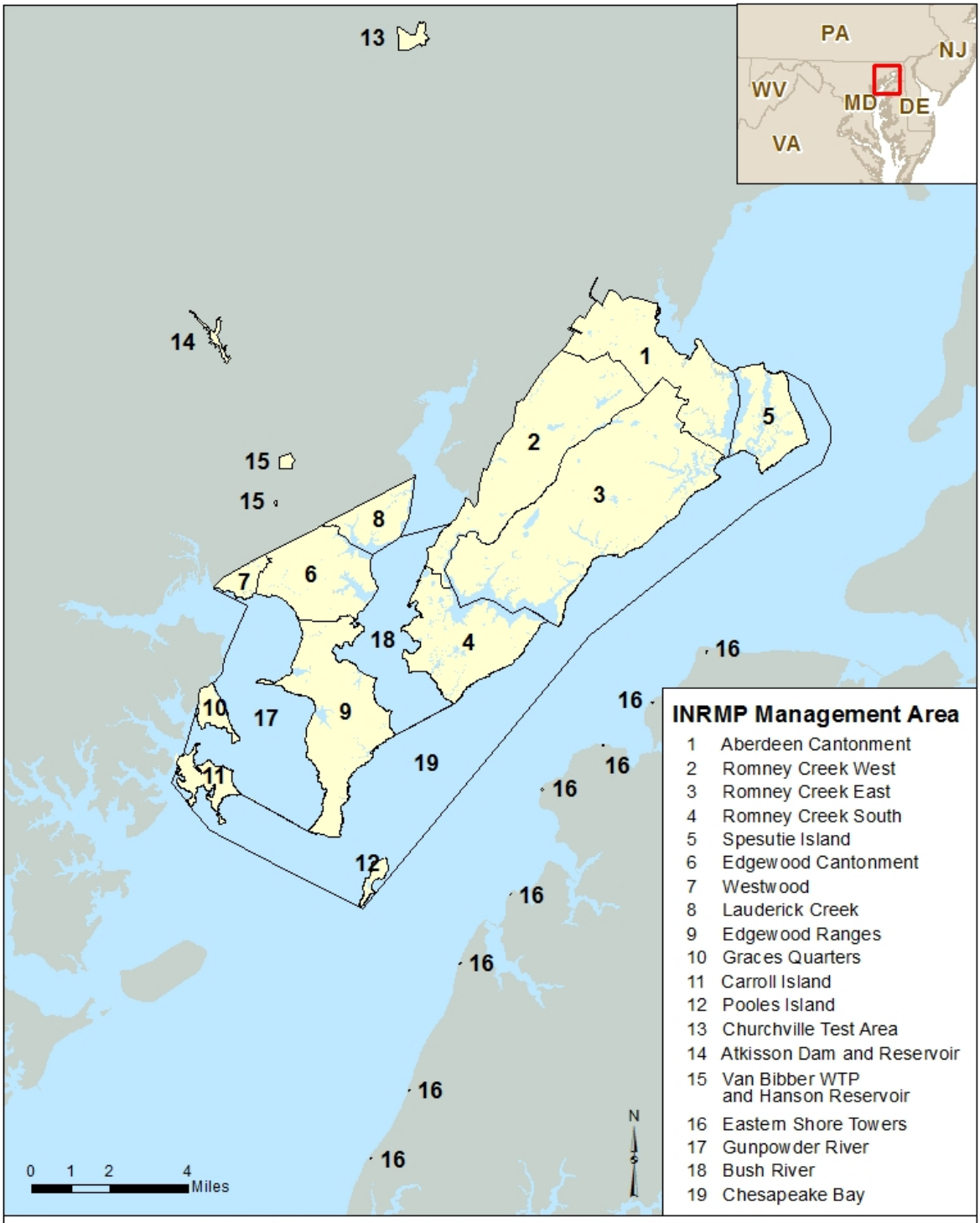
  The Aberdeen Cantonment area is 4,817 acres and is mostly developed with small fragmented areas of forest and wetlands. The largest forest stands and wetlands surround Dipper Creek and Woodrest Creek. The management area includes research and development facilities, industrial activities (including a wastewater treatment plant), supply and storage, medical, family and officer housing, office buildings, and recreational facilities (golf course, marina, picnic area, etc.). The area also includes a number of firing ranges, testing areas, and a vehicle test track, because the habitat surrounding these ranges is mostly developed and managed similarly to cantonment facilities. Numerous buildings in the area are identified for demolition, providing an opportunity to capture credit for removal of impervious surfaces. The area also includes an Enhanced Use Lease (EUL) site of office and technology buildings. A large resident population of Canada geese in the Aberdeen Cantonment area poses a management challenge, especially around the C4ISR campus.

- **Romney Creek West**

  The Romney Creek West area is composed of 6,512 acres of developed range areas, an airfield, vehicle test tracks, and large tracts of forests and wetlands. The area is bordered to the west by off-Post industrial, agricultural, and residential land. Designated hunting areas are located throughout the Romney Creek West area. There are opportunities in the area for broader habitat enhancement and rehabilitation. Beavers are a management challenge in the area, continually building dams in Romney Creek and tributaries, leading to repeated flooding of low-lying roadways and range areas.

- **Romney Creek East**

  The Romney Creek East area consists of 12,060 acres and includes numerous range areas (firing points and impact areas), supporting facilities and infrastructure to conduct testing and training missions, and large tracts of forests and wetlands. Beavers are a management challenge in the area, continually building dams in Romney Creek and tributaries, leading to repeated flooding of low-lying roadways and range areas. Designated hunting areas are located in the Romney Creek East area, however, access to many of the hunting areas is restricted due to mission conflicts and/or risk from unexploded ordnance (UXO).



ABERDEEN PROVING GROUND, MARYLAND

Figure 2-2 INRMP Management Areas

UXO presents a significant hazard in the area. Maintenance of range lands through defined mowing schedules is also a significant issue, as areas left un-mown quickly fill in with trees and reduce lines of sight needed for firing activities. Shoreline stabilization is needed on sections of shoreline prone to erosion.

- **Romney Creek South**

  The Romney Creek South area consists of 4,164 acres of forests and extensive wetlands with interspersed range areas (firing points and impact areas). Designated hunting areas are located throughout the Romney Creek South area, however, access to most of the hunting areas is restricted due to mission conflicts and/or risk from UXO. UXO presents a significant hazard in the area. This management area is one of the most productive for bald eagles, with 10 to 13 nest territories every year. Shoreline stabilization is needed on sections of shoreline prone to erosion.

- **Spesutie Island**

  Spesutie Island is 2,290 acres and is connected to the Aberdeen peninsula by a causeway. Spesutie Island has numerous range areas and other supporting facilities and infrastructure to conduct testing missions. The remainder of the island is wetlands and small forest stands. The island is bisected into two legs (West Leg and East Leg) by Back Creek. The average elevation on Spesutie Island is only 4 to 6 feet, and the ranges and facilities are frequently impacted by high water. The island is surrounded by open waters of the Chesapeake Bay and Spesutie Narrows and provides optimal habitat for bald eagles, including 6 to 7 overlapping nest territories every year. Shoreline stabilization is needed on sections of shoreline prone to erosion.

Edgewood Area:

- **Edgewood Cantonment**

  The Edgewood Cantonment area is 3,355 acres and is mostly developed with small fragmented areas of forests and wetlands. The largest forest stands and wetlands surround Canal Creek and Kings Creek. The management area includes research and development laboratories, industrial activities (including water and wastewater treatment plants), supply and storage, medical, an airfield, family and officer housing, office buildings, and recreational facilities (golf course, marina, picnic area, etc.). There are infrequently mowed grassland areas which could be targeted for agricultural outleasing as hay fields. Numerous buildings in the area are identified for demolition, providing an opportunity to capture credit for removal of impervious surfaces. The far western portion of the Edgewood Cantonment area (warehouses bordering the Westwood area) is identified as a potential EUL site.

- **Westwood**

  The Westwood area is 473 acres and is mostly undeveloped with forests and wetlands and the Reardon Inlet creek. A capped sanitary landfill is located in the middle of the area. This management area has little mission activity.

- **Lauderick Creek**

  The Lauderick Creek area is 1,450 acres consisting primarily of forests and wetlands, a small (50-acre) grassland area, and a few buildings in cleared areas. The area is bordered to the north by off-Post housing and schools. A portion of the Lauderick Creek area is leased to the Maryland Fire and Rescue Institute for use of a training facility. The majority of the remaining area is licensed to the MDARNG. The MDARNG (and the U.S. Army Reserves) utilizes the area as a soldier training site for mostly light impact activities (helicopter and ground maneuvers, land navigation, and bivouac).

- **Edgewood Ranges**

  The Edgewood Ranges area is 4,983 acres and comprises all active range areas and surrounding habitat on the Edgewood peninsula. The area is divided into range fields based on mission use; however, the area is managed as a whole in this INRMP. The Edgewood Ranges area has larger expanses of forest stands and wetlands than the cantonment area, providing opportunities for broad habitat enhancement and rehabilitation. The undeveloped shorelines provide optimal habitat for bald eagles, including 7 to 10 nest territories every year. Designated hunting areas are located throughout the Edgewood Ranges, however, access to many of the hunting areas is restricted due to mission conflicts and/or risk from UXO. UXO presents a significant hazard in the Edgewood Ranges area. Maintenance of range lands through defined mowing schedules is also a significant issue, as areas left un-mown quickly fill in with trees and reduce lines of sight needed for firing activities. Shoreline stabilization is needed on sections of shoreline prone to erosion.

- **Graces Quarters**

  Graces Quarters is 466 acres and is bordered by open water and an off-Post State park. ARL occupies the northeastern corner of Graces Quarters. The rest of Graces Quarters remains an undeveloped area of forests and wetlands, with a few small buildings and structures supporting a groundwater remediation site. Aside from the ARL site and the groundwater remediation site, Graces Quarters is relatively undisturbed by mission activities. Graces Quarters is identified as a limited-access natural resources management area.

- **Carroll Island**

  Carroll Island is 796 acres and is bordered by open water and an off-Post power plant. The area is comprised of forests and wetlands and provides opportunities for habitat enhancement and/or mitigation. Four wetlands mitigation sites are located in the center of the island. Carroll Island is relatively undisturbed by mission activities. Carroll Island is identified as a limited-access natural resources management area.

- **Pooles Island**

  Pooles Island is 209 acres and is located in the Chesapeake Bay south of the Edgewood peninsula. The island is entirely undeveloped with no buildings, except for an historic lighthouse on the northwest shoreline. The island consists of forests and wetlands and presents a significant natural and cultural resources area. A small clearing was re-established behind the lighthouse to accommodate helicopter landings for dignitary tours; however, extreme care is warranted for use of this landing area to avoid sand blown wind damage to the lighthouse, surrounding trees, and wildlife. The island supports 3 to 4 bald eagle nests every year, in addition to the largest great blue heron rookery in the Chesapeake Bay. Future mission activity at the island could potentially include testing of communication systems through vegetation canopies, and a shoreline stabilization effort using beneficial re-use of dredged materials.

Other:

- **Churchville Test Area**

  The Churchville Test Area is 221 acres and consists of cross-country courses and slopes for endurance testing of all types of automotive vehicles and equipment. The area is bordered by Deer Creek and off-Post farmland and residential housing. To minimize conflicts between military activities and off-Post land uses, APG partnered with Harford Land Trust to secure a conservation easement on a 162-acre parcel of land adjacent to the Churchville Test Area's northern boundary. This easement project proactively addressed the growing concern that an incompatible land use could impact the future viability of the military test track. There remains, however, the potential for conflicts between military activities at the test track and off-Post land uses. Testing activities can create noise and dust which can impact off-Post properties. Additionally, line of sight signal transmission between the Aberdeen Area and Churchville Test Area can be impacted from off-Post sources of ground-based signal interference.

- **Atkisson Dam and Reservoir**

  Atkisson Dam was built during World War II to provide a reservoir of water for APG operations and activities. It was never used for that purpose. The 75-acre reservoir and dam are located along Winters Run in Harford County, Maryland. The reservoir is bordered by Harford Glen Environmental Education Center and residential housing. APG owns the dam, the reservoir, and the land immediately

surrounding the reservoir up to the 130-foot contour line (total of 126 acres). The dam's current function is to support limited upstream recreation at Harford Glen and to retain the upstream accumulated sediment. Because of the dam's off-site location, it is virtually impossible to ensure that security fencing and danger warning signs are adequately maintained at all times. It poses a serious risk to adults or children who knowingly or unknowingly trespass on the property. The reservoir and dam are considered excess property. The Army is completing engineering studies to further evaluate the dam with the objective of eventually being able to excess it. There are multiple stakeholders in the surrounding area (Harford County government, Harford County Board of Education, homeowners association, and individual private property owners). APG has little to no natural resources management prescribed for this area, except for continued monitoring of the bald eagle nest located along the shoreline of the reservoir.

- **Van Bibber Water Treatment Plant and Hanson Reservoir**

  The Van Bibber Water Treatment Plant and Hanson Reservoir comprises 81 acres along the Winters Run tributary. Surface water is withdrawn from the reservoir into the water treatment plant and flows into the water supply for the Edgewood Area of APG. The operations of the water treatment plant may be privatized in the future. There is little to no natural resources management prescribed for this area, except for continued maintenance of the fish ladder. The area is APG's closest wildland-urban interface and consequently is a high priority for managing wildfire risk.

- **Eastern Shore Towers**

  APG has eight towers located on the eastern shoreline of the Chesapeake Bay in Kent County. The towers are spaced two to three miles apart from Howell Point to Tolchester Beach. These towers were used during World War I and World War II testing activities to observe impacts of long-range rounds. Currently, noise monitors and cameras are mounted on these towers. APG owns a small plot of land at the base of each tower (4.7 acres in total for all eight towers). Ospreys routinely nest on some of the towers, and may hinder repair or maintenance of the towers during nesting season. The additional weight from an osprey nest may also compromise the structural integrity of a tower. Some of the tower sites are overgrown with vegetation, while others are maintained to some extent by adjacent land owners.

Waters:

- **Gunpowder River**

  The Gunpowder River area is 7,412 acres of open water and includes the sub-aqueous land. UXO presents a significant hazard in the waters of APG and can be encountered in the sediments. When not closed for mission activities, the Gunpowder River area is open to fishing and recreational boaters in accordance

with APG regulations. The Gunpowder River area supports various aquatic species of fish, plants, and other wildlife.

- **Bush River**

  The Bush River area is 4,450 acres of open water and includes the sub-aqueous land. UXO presents a significant hazard in the waters of APG and can be encountered in the sediments. When not closed for mission activities, the Bush River area is open to fishing and recreational boaters in accordance with APG regulations. The Bush River area supports various aquatic species of fish, plants, and other wildlife.

- **Chesapeake Bay**

  The Chesapeake Bay area is 18,414 acres of open water and includes the sub-aqueous land. UXO presents a significant hazard in the waters of APG and can be encountered in the sediments. When not closed for mission activities, the Chesapeake Bay area is open to fishing and recreational boaters in accordance with APG regulations. The Chesapeake Bay area supports various aquatic species of fish, plants, and other wildlife.

2.2 REGIONAL LAND USE

Harford County is bounded by Baltimore County on the west, the Commonwealth of Pennsylvania to the north, the Susquehanna River to the east, and the Chesapeake Bay to the south. With a land area of 437 square miles, Harford County is the 11th largest county in the state of Maryland. The county population is approximately 250,105 (2014 U.S. Census Bureau). The city of Bel Air is located approximately seven miles north of the Edgewood Area, and is the largest urban center in the county with a population of approximately 88,000. The northern half of Harford County is predominantly agricultural in nature, while the southern half (including Aberdeen and Edgewood) is generally urbanized.

Harford County land use bordering APG is predominately low to medium intensity urban residential with areas of general industrial zoning. The Aberdeen Area is also bordered by light industrial zoning and town zoning. The open waters of the Gunpowder River, Bush River, and Chesapeake Bay are used for recreational boating, fishing, and crabbing, as well as commercial fishing.

Baltimore County has a land area of 598 square miles and an estimated population of 826,925 (2014 U.S. Census Bureau). The Baltimore County land use bordering APG (Graces Quarters and Carroll Island) is zoned for rural residential and resource conservation. Graces Quarters is immediately bordered by a state park, and Carroll Island is immediately bordered by a coal-fired power plant. The Gunpowder River around Graces Quarters and Carroll Island provides for commercial and recreational fishing and boating.

2.3 HISTORIC LAND USE

For hundreds of years before the arrival of European settlers, the area from the northern Chesapeake Bay up to New York was home to the Susquehannock native tribes. In 1600, the population was estimated as high as 7,000 but by 1700, war, disease and tribe dispersion had devastated the population to a few hundred. The last remaining Susquehannock people were killed in a 1763 massacre by Scots-Irish immigrants in Pennsylvania in the aftermath of the French and Indian war.

Captain John Smith began the exploration of the Chesapeake Bay in 1608 when he left the settlement at Jamestown, Virginia to head north. Exploring the many tributaries of the Bay, he discovered several rivers such as the Bush, Susquehanna, North East, Elk, and Sassafras Rivers.

In 1624, the English King James I granted land area to Lord Baltimore. This area included present day Delaware, Maryland, parts of Pennsylvania and northern Virginia. By the mid-1600s, early colonists settled along the waterways and tributaries. Spesutie Island was settled in 1658, and the mainland in 1661. The area's fertile lands supported a thriving agricultural industry and canning facilities for the local produce, mainly tomatoes, corn, and peaches.

After the U.S. entered World War I, there was an urgent need for new facilities for the development and testing of weapons and ammunition, and for the research, testing, and manufacturing of chemical weapons. Colonel Colden L. Ruggles found the fertile farmland peninsulas (Gunpowder Neck and Bush Neck) between the Gunpowder River, Bush River, and Chesapeake Bay to be an appropriate site for a new Army proving ground. The goal was to provide the military with facilities where design and testing of ordnance material could be carried out in close proximity to the Nation's industrial and shipping centers. After an Act of Congress and two Presidential proclamations, the farmers were persuaded to leave their properties. The U.S. Government officially took possession of the land on October 20, 1917 and immediately began building testing facilities. The post officially opened on December 14, 1917, and the first gun was fired on January 2, 1918.

The Army lands south of the city of Aberdeen on the former Bush Neck peninsula became Aberdeen Proving Ground. This peninsula was dedicated to munitions testing and evaluation. The Edgewood peninsula (formerly the Gunpowder Neck and later the Edgewood Arsenal) focused on chemical weapons research and development. Additional properties, including Spesutie Island, were added to the installation between 1940 and 1943. In 1971, APG and Edgewood Arsenal were merged to form the consolidated Aberdeen Proving Ground.

2.4 MILITARY MISSION

APG is recognized as one of the world's most important research and development, testing and evaluation facilities for military weapons and materiel, and supports the finest teams of military and civilian scientists, research engineers, technicians, and

administrators. APG has five core areas of operations or military support labeled Centers of Excellence:

1. Public Health and Medical Research
2. Test and Evaluation
3. Research and Development
4. Chemical, Biological, Radiological, Nuclear and Explosives
5. C4ISR

APG has historically been a center for Army ordnance training. Historically known as "Home of the Ordnance", APG has been connected throughout its history with developing and testing military materiel, as well as training officers and enlisted personnel to use and maintain ammunition.

APG's mission continues to evolve to meet military transformation needs and to keep pace with the growing technologies of war. As a result of the 2005 Base Realignment and Closure Commission report, APG gained and lost several tenants. New tenants to APG included the CECOM, the U.S. Army Test and Evaluation Command, the Non-Medical Chemical and Biological Defense, the Defense Threat Reduction Agency, the Walter Reed Army Institute of Research, the Army Research Institute, and the U.S. Army Research Laboratory Vehicle Technology Directorate. APG lost several organizations including the U.S. Army Ordnance Center and School, and the Army Environmental Command.

Since completion of the Base Realignment and Closure transformation in 2011, APG has become a major hub of research, development, test, and evaluation activity for the joint services. APG continues to support the development and testing of all Army materiel including ordnance, weaponry, vehicles, equipment, and soldier systems. With the move of CECOM to APG, APG's military mission also includes the research and evaluation of the most advanced communication systems to support the Warfighter. APG is now home to 18 major commands and supports more than 80 tenants and numerous satellite and private activities.

2.5 OPERATIONS AND INFRASTRUCTURE

2.5.1 Population

With more than 21,000 civilian, contractor, and military employees, APG is Harford County's largest employer and one of the largest employers in Maryland. Unlike many Army installations, APG's population is composed primarily of civilians. The completion of the Base Realignment and Closure transformation in 2011 resulted in an increase of civilian employees and a decrease in active military members.

2.5.2 Cantonment Area

The cantonment areas are the most developed portions of the installation. Generally, the areas contain housing and recreational areas, office buildings, industrial support facilities, supply and storage facilities, medical facilities, research and development

facilities, housing areas, and recreational facilities. APG has two cantonment areas: one in the Aberdeen Area and one in the Edgewood Area.

The Aberdeen Area cantonment, as defined in APG's Real Property Master Plan, includes the majority of the installation support services, Garrison headquarters, family and officer housing, Ruggles golf course, Shore Park and Woodpecker Point picnic areas, and the Spesutie Island marina. The cantonment also includes research and development facilities (C4ISR, Government and Technology Enterprise [GATE] EUL site, etc.).

The Edgewood Area cantonment, as defined in APG's Real Property Master Plan, is less structured and more spatially spread out than the Aberdeen Area cantonment. Most notably, the Edgewood Area cantonment includes installation support offices, family and officer housing, water and wastewater treatment plants, Exton golf course, Skippers Point and Civilian Activity picnic areas, Gunpowder Neck marina, and Weide airfield. The cantonment also includes research and development facilities and the MDARNG Lauderick Creek Training Area.

2.5.3 Airfields

APG has two airfields: one in the Aberdeen Area and one in the Edgewood Area.

The Phillips Army Airfield (PAAF) is located in the Aberdeen Area, in the restricted area. The PAAF includes: an 8,000-foot hard-surfaced runway, four surveyed drop zones, one helipad, and three bomb ramps. There are also several air operations support facilities including: main hangar, control tower, taxiways, off-loading area, aprons, and other airfield operations facilities. The PAAF is operated by ATC, but accommodates other Garrison and tenant activities including a growing number of fixed wing operations. White-tailed deer, raptors, trees, and wetlands continue to be environmental hazards at the PAAF.

The Weide Army Heliport (WAH) is located in the cantonment of the Edgewood Area. The heliport serves as an Army Aviation Support Facility for the MDARNG. The WAH includes a 1,600-foot hard-surfaced runway with overrun, two hangars, and aviation support facilities for flight operations, offices, maintenance, and storage. Environmental hazards at WAH include white-tailed deer, Canada geese, and gulls.

2.5.4 Automotive Test Courses

APG has a number of automotive test courses for manned and unmanned ground vehicles. The Munson Test Area, Perryman Test Area, and Automotive Technology Evaluation Facility (ATEF) are located in the Aberdeen Area. The Munson Test Area is comprised of 9 miles of test courses designed for making specific measurements and determinations of vehicle performance in the field. The Perryman Test Area is used mainly for cross-country testing of vehicles for durability and reliability. The ATEF is a 4.5 mile, high-speed vehicle test track that encircles the PAAF. Smaller automotive test courses are also located in the Aberdeen Area, and include the Dynamometer Course,

an unmanned ground vehicle course, Mile Loop, portions of the PAAF, and an unmanned aerial vehicle course on Spesutie Island.

The Churchville Test Area is a separate land parcel located approximately 10 miles north of the main installation. This test area includes 11 miles of interconnecting roads and test courses of mud, dirt, and gravel surfaces on various grades, and is used to test the endurance and reliability of all types of automotive vehicles.

Stryker combat vehicle on cross-country test course

2.5.5 Firing Ranges and Impact Areas

As a proving ground, firing ranges and impact areas comprise a large portion of APG. The complex of ranges has and continues to accommodate nearly all types of ammunition firings from small arms to medium and large caliber rounds, and static detonations. Approximately three dozen ranges and impact areas at APG offer nearly 200 different firing positions. The habitats surrounding the majority of the firing ranges and impact areas are largely un-developed and provide opportunities for habitat enhancement. However, UXO is likely at and around all ranges, and can hinder natural resources management activities.

Test firing of 120-mm cannon

2.5.6 Other Testing and Training Areas

Other testing areas (indoors and outdoors) are located throughout APG, many in close proximity to the firing ranges. This close association of testing (and research) facilities with firing positions facilitates life-cycle testing of Army materiels, from concept to proofing. Testing facilities include controlled chambers, instrumentation buildings, transportability platforms, human factors engineering, and other performance evaluation facilities. The open waters of APG are utilized as test areas for boats, amphibious vehicles, and associated equipment for maneuverability and swim testing.

Training areas encompass a smaller portion of APG than the testing areas, and are often co-located with range, industrial, or other areas. Notable training areas include: 1) the support facilities and grounds at Mulberry Point which are used for unit training, bivouac, and ground maneuvers, 2) Lauderick Creek area which is used by the MDARNG and U.S. Army Reserves, and 3) Westwood Area and Skippers Point area which are used for local county law enforcement training. There are also small arms firing ranges (e.g., Light Rifle Range; Soldier System Test Facilities Indoor Range) which can be used for soldier familiarization and qualification testing. The open waters of the Chesapeake Bay just off-shore of the Aberdeen Area are utilized for Warfighter training including boat maneuvers, swimmer insertion/extraction, and boat to shore live

firing with close air support. The Gunpowder River is used for swift water rescue training by the MDARNG and Baltimore County Fire Department.

Warfighter training in urban terrain setting

2.6 NATURAL ENVIRONMENT

This section describes the general climate, setting, physical and biological environments of APG. APG contains abundant living and non-living natural resources. Forests, ephemeral pools, fields, wetlands, beaches, tidal streams and flats, rivers, islands and a portion of the Chesapeake Bay, are all found within the boundaries of the installation. Most of APG's natural resources are located in the restricted areas of the installation. The nature of mission activities in these areas precludes extensive development, resulting in the preservation of large tracts of undeveloped lands.

2.6.1 Climate

APG has a temperate climate that is mainly influenced by continental and offshore maritime air masses. The general flow of the atmospheric currents from west to east brings cold, dry continental air masses into the area. The Appalachian Mountains to the west, however, shelter the area from the severity of the cold air masses. Also, the moderating effects of the Atlantic Ocean and Chesapeake Bay currents produce warmer, milder winters in the area than are experienced by the inland regions farther west.

APG has warm, humid summers and wet, cool winters. From 2010-2015, the average daily temperatures ranged from a low of 22 degrees Fahrenheit (ºF) in January to a high of 88ºF in July (ATC – Atmospheric Effects, Measurements and Modeling Team, pers. com.). The average yearly rainfall is 37 inches, which is distributed fairly evenly throughout the year. On average, snowfall in excess of 1 inch occurs approximately 6 days a year, and averages a total of 25 days of snow per year. The prevailing winds are from the northwest during the winter months and southerly during the summer months. Typically, winter and spring account for the highest average wind speeds, averaging 7 to 8 miles per hour (mph). Occasionally, during severe thunderstorms, hurricanes, or intense winter storms, the wind speed can exceed 50 mph.

2.6.2 Topography, Geology, Hydrogeology, and Soils

APG lies within the Atlantic Coastal Plain physiographic province, which is characterized by low hills, shallow valleys, and flat plains. Elevations at APG range from sea level to approximately 60 feet above sea level. Major portions of the installation occur within the 1 percent chance (100 year) flood zone established by the U.S. Army Corps of Engineers (USACE). Most slopes on the installation occur within the 0 to 10 percent range. Limited sections of shoreline have steeper slopes of 20 percent or greater.

The Atlantic Coastal Plain Province is underlain by unconsolidated sediments such as clay, silt, sand, and gravel. These sediments form a wedge-shaped body that grows thicker from east to southeast and overlies a basement of Precambrian to Paleozoic crystalline rocks and Mesozoic rift-basin sedimentary rocks. At Spesutie Island, the thickness of the sediments is about 700 feet (Drummond and Blomquist 1993). The depth to pre-Cretaceous rocks at APG can exceed 600 feet.

Within the Atlantic Coastal Plain Province, the Potomac Group (Cretaceous Age) contains the primary water-bearing formations (Patuxent formation and Patapsco formation). The primary water-bearing formation in the APG region is the Patuxent formation (USACE 2003). The Patapsco formation contains beds of sand and gravels that also yield large quantities of water. The Patapsco formation is often in direct hydrologic contact with the Chesapeake Bay, making brackish water intrusion a potential problem. Groundwater flow is generally slow and in a southeasterly direction.

The predominant upland soil on APG is generally very deep, nearly level to gently rolling, and somewhat poorly drained to moderately well drained. Loamy and silty alluvial and marine sediments underlie the upland soil. Soil of the floodplains and marshes of APG is generally deep to very deep, smooth and nearly level, and very poorly drained to moderately well drained. It is underlain by highly decomposed material and sandy or loamy alluvial, estuarine, and marine sediment. The most recent soil survey of the installation was performed in 1998 by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS 1998). A total of 39 soil map units or soil types cover the installation (Appendix A). The predominant soil types include Mattapex, Romney, Udorthents, and Woodstown series.

2.6.3 Ecoregions

Ecoregions are areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. Ecoregions serve as a framework for structuring and implementing ecosystem management strategies across federal and state agencies and other organizations that are responsible for environmental resources within the same geographical areas.

The Commission for Environmental Cooperation developed a 4-tiered structure of ecoregions for North America, starting at the broadest scale (Level I) and ending in the most specific Level IV scale (CEC 1997). With each level, ecoregions are further distinguished based on climate, geology, and biotic characteristics. APG falls within the following ecoregions:

- **Level I Ecoregion – Eastern Temperate Forests**

  This region has a moderate to mildly humid climate, relatively dense and diverse forest cover, and a high density of human inhabitants.

- **Level II Ecoregion – Mississippi Alluvial and Southeast Coastal Plains**

  This region is characterized by moderately flat plains with many wetlands, a mix of seasonally flooded forests (ash, oak, tupelo, bald cypress) and southern mixed

forests (beech, sweetgum, magnolias, oaks, pine, saw palmetto), and forestry and agriculture activities along with urban activities.

- **Level III Ecoregion – Middle Atlantic Coastal Plain**

  This region stretches from Delaware to the South Carolina/Georgia border and consists of low elevation flat plains, with many swamps, marshes, and estuaries. Forest cover in the region is mostly loblolly and some shortleaf pine to the south, with patches of oak, gum, and cypress near major streams. The low terraces, marshes, dunes, barrier islands, and beaches are underlain by unconsolidated sediments. Poorly drained soils are common, and the region has a mix of coarse and fine textured soils.

- **Level IV Ecoregion – Chesapeake-Pamlico Lowlands and Tidal Marshes**

  Nearly all of the Chesapeake Bay shorelines fall within this ecoregion. This region is universally low in elevation and is characterized by nearly flat terrain, terraces, tidal marshes, ponds, and streams. Streams are usually low in gradient, sluggish, and tidally influenced; they are fed by shallow groundwater aquifers and become brackish as they begin to mix with the Chesapeake Bay. Wide riparian wetlands are common. Brackish wetlands are common and serve as habitat for fish, shellfish, and wildfowl. Elevations range from 0 to 50 feet and relief is less than 35 feet. Alluvial sand and silt, estuarine sand and silt, saline marsh deposits, and marine sand, silt, and clay are common. The soils support a potential natural vegetation of oak-hickory-pine forest, fresh to brackish marsh grasses, and floodplain forest. Forests and agriculture, including corn and soybean farming, are found where natural or artificial drainage is sufficient. Urban and industrial areas are found near large harbors.

APG is inherently connected to the Chesapeake Bay and the associated ecoregion. With increasing development of Bay shorelines, APG continues to be a “green oasis” and serves as a very significant natural resources area for the Bay region. Balancing an ever evolving military mission with the protection of over 72,000 acres of natural resources is a challenging task. This task is complicated by the strict federal and state regulatory framework in place for protecting the critically sensitive Chesapeake Bay and its environmental resources.

2.6.4 Land Cover

Land cover on APG consists of forested uplands, shrub uplands, frequently and infrequently mowed grass fields, forested wetlands, shrub-scrub wetlands, marsh, open water, bare earth, and developed or paved areas (Figure 2-3). Open water, forests, and wetlands comprise most of the land cover (46 percent, 25 percent, and 18 percent, respectively). The bare earth or no vegetative cover areas include areas maintained for specific purposes (e.g., minefields, demolition fields, permeable infiltration unit, etc.).

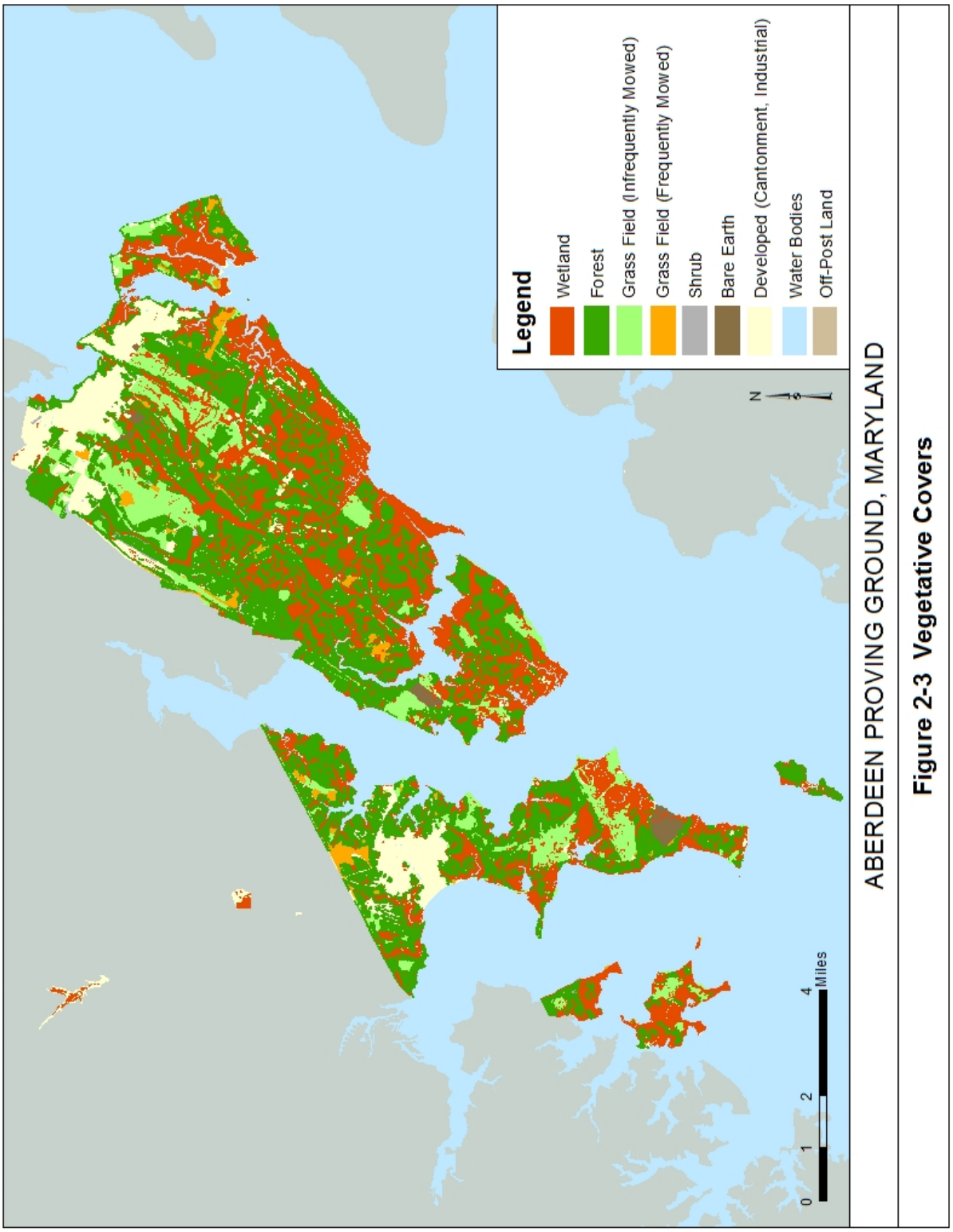


Figure 2-3 Vegetative Covers

Historic activities at APG have resulted in the potential for UXO in all portions of the installation. While UXO is most frequently encountered in the restricted areas, there remains the potential to find UXO in cantonment areas too, and also in the sediments of open waters.

2.6.5 Watersheds and Aquatic Habitats

Surface waters and wetlands account for 45,905 acres of APG property, or 64 percent.

2.6.5.1 Watersheds

APG is contained within the Upper Western Shore Tributary Basin of the Chesapeake Bay, which drains an area of 685 square miles including all of Harford County and parts of Baltimore, Cecil, and Carroll Counties (MDDNR 2007). Overall, the water quality of the Upper Western Shore Basin has been improving over the last three decades (IAN 2013). Aquatic grass beds and benthic communities, in particular, have recently shown improving health.

To the east, APG borders the Upper Bay Tributary Basin. This tributary basin shows moderate ecosystem health (IAN 2013). This area remained steady in 2013 with small improvements in some indicators and small declines in others. Over time, this region is showing a significantly improving trend.

The tributary basins are further delineated into many smaller areas, or watershed segments. The main portions of APG lie within the Middle River Oligohaline, Gunpowder River Oligohaline, Bush River Oligohaline, Northern Chesapeake Bay Oligohaline, and Northern Chesapeake Bay Tidal Fresh segments (Figure 2-4). APG's smaller non-contiguous properties (Pooles Island, Churchville Test Area, Atkisson Reservoir and Dam, Van Bibber Water Treatment Plant and Hanson Reservoir, and Eastern Shore Towers) are located within other watershed segments.

In 2010, after decades of voluntary efforts to restore the Chesapeake Bay, the U.S. Environmental Protection Agency (USEPA) established pollution load limits to restrict three major pollutants impairing the waters of the Chesapeake Bay: nitrogen, phosphorus, and sediment. These loading limits or Total Maximum Daily Loads (TMDLs) set clear goals for reducing excess pollution, and are science-based estimates of the amount of each substance the Bay and its tributaries can receive and still meet standards for clean, healthy water. The establishment of TMDLs was prompted by insufficient restoration progress and continued poor water quality in the Bay and its tributaries. The TMDLs are designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of pollution reductions completed by 2017. TMDLs are established for all of the Bay watershed segments.

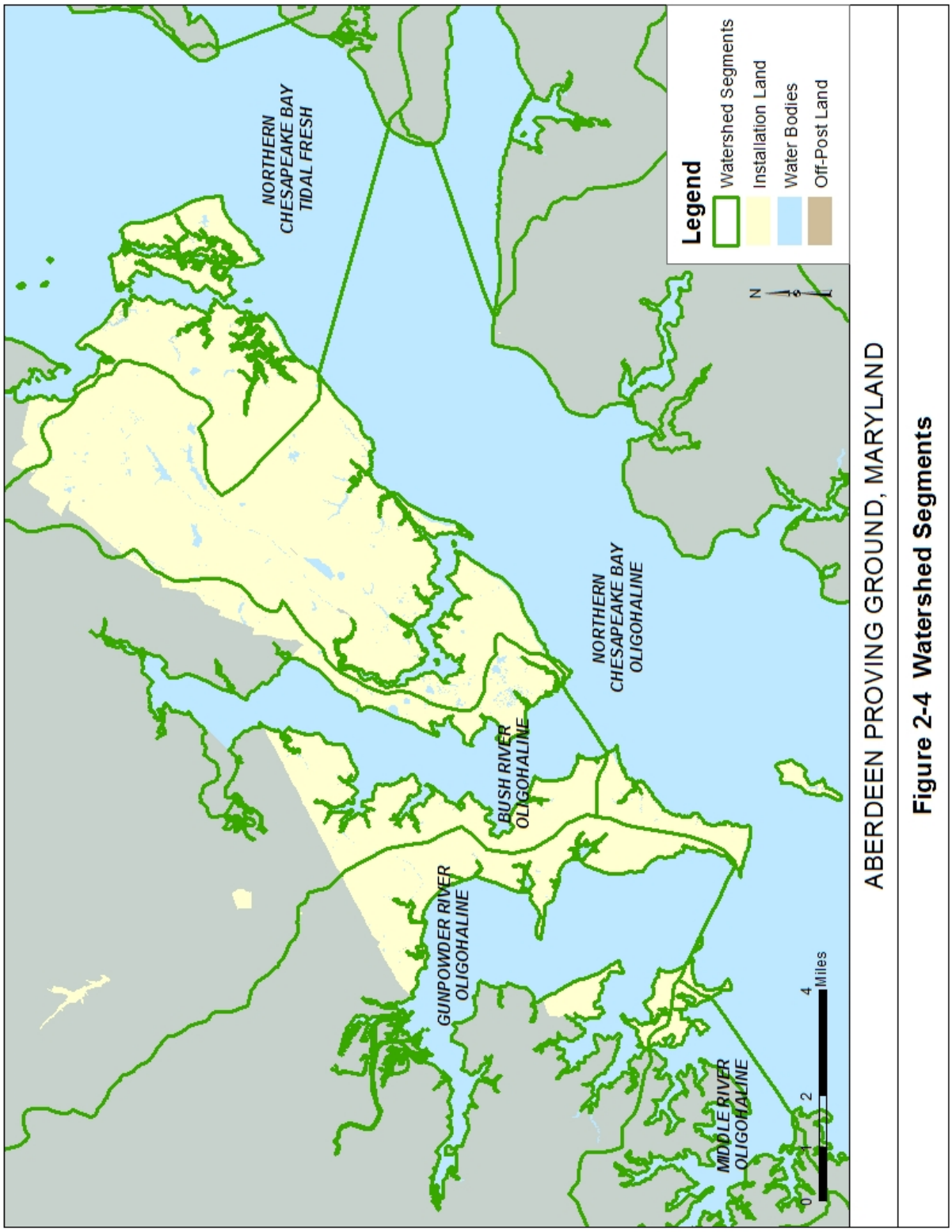


Figure 2-4 Watershed Segments

2.6.5.2 Surface Waters

Nearly half of the total acreage of APG consists of surface water. Surface drainage at APG is to the Chesapeake Bay, Bush and Gunpowder Rivers, or to creeks that discharge to these water bodies. The topography of the APG region is broadly flat with occasional low hills, resulting in generally shallow and sluggish surface waters. The average depth of the Chesapeake Bay in the vicinity of APG is 15 feet. The average depth of estuarine waters at APG is approximately 7 feet (mean low tide) and rarely exceeds 15 feet. Surface waters of APG range from fresh (0 psu) to brackish (up to 12 psu). There are numerous creeks and streams on the installation (13 in the Aberdeen Area and 10 in the Edgewood Area, Figure 2-5). Romney Creek which flows north to south through the Aberdeen peninsula is a major tributary draining into the Chesapeake Bay.

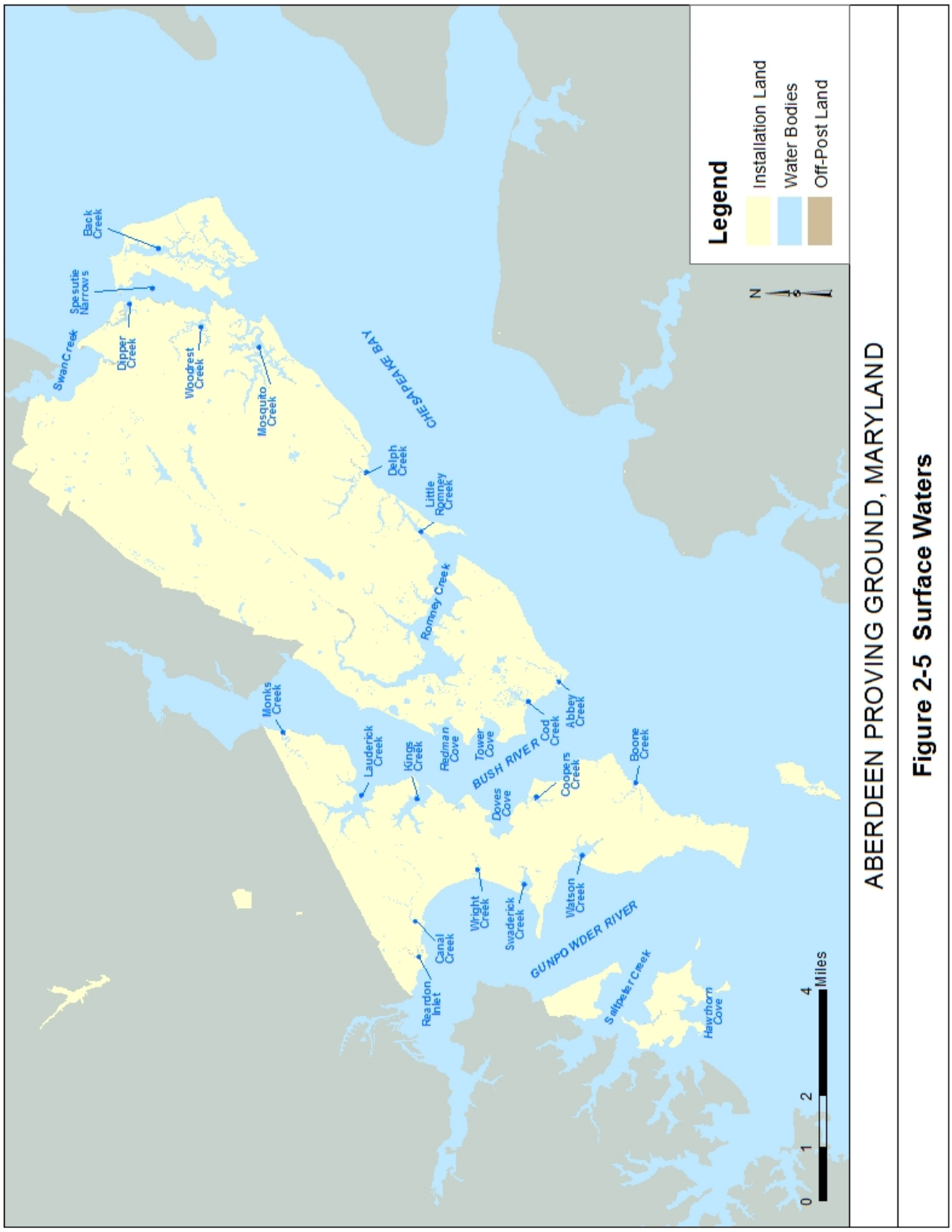
In the developed areas of APG, stormwater runoff is managed by storm sewers and catch basins. In less developed areas, runoff is managed by drainage swales. In order to protect the water quality of the tributaries and rivers, APG implements measures around disturbed areas (e.g., construction sites) to minimize stormwater runoff, erosion, and sedimentation.

2.6.5.3 Wetlands

A wetland is an area inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support hydric soils and hydrophytic vegetation. The topographic relief of APG is fairly low with a relatively shallow water table. Consequently, APG contains many wetlands. Wetlands provide several beneficial functions including supplying habitat for a variety of wildlife, storage and attenuation of floodwaters, trapping silts and other sediments during floods, and biologically filtering contaminants from surface waters.

A USFWS National Wetlands Inventory (NWI) was conducted at APG in 1991. The NWI classified and mapped the wetlands and deepwater habitats. This inventory has since been supplemented by additional surveys (most recently in July 2015) and infrared aerial photographs. Of APG's total 72,283 acres (land and water), approximately 18 percent (12,695 acres) are wetlands and 46 percent (33,210 acres) are deepwater (open water) habitats. In total, it is estimated that 64 percent of APG is wetland or open water (Figure 2-6).

Wetlands are classified into five systems (marine, estuarine, riverine, lacustrine, and palustrine), then further separated into subsystems (subtidal, intertidal, etc.) based on water inundation, and vegetative classes (aquatic bed, emergent, scrub-shrub, forested, etc.). APG has a mix of wetlands existing as tidal marshes along the shorelines of the Chesapeake Bay, Bush River, and Gunpowder River to non-tidal wetlands scattered throughout the installation as natural depressions, ordnance testing craters, and poorly drained soils. APG is dominated by estuarine emergent wetlands and non-tidal palustrine forested wetlands. Wetland boundaries change frequently due to changing hydrology brought on by natural succession, beaver activity, and human-induced


Legend
Installation Land
Water Bodies
Off-Post Land
N
ABERDEEN PROVING GROUND, MARYLAND
Figure 2-5 Surface Waters
CHESAPEAKE BAY
BUSH RIVER
GUNPOWDER RIVER
Back Creek
Spesutie Narrows
Swan Creek
Dipper Creek
Woodrest Creek
Mosquito Creek
Delph Creek
Little Romney Creek
Romney Creek
Monks Creek
Lauderick Creek
Kings Creek
Redman Cove
Tower Cove
Cod Creek
Abbey Creek
Coopers Creek
Doves Cove
Boone Creek
Wright Creek
Swaderick Creek
Watson Creek
Canal Creek
Reardon Inlet
Saltpeter Creek
Hawthorn Cove
0 1 2 4 Miles

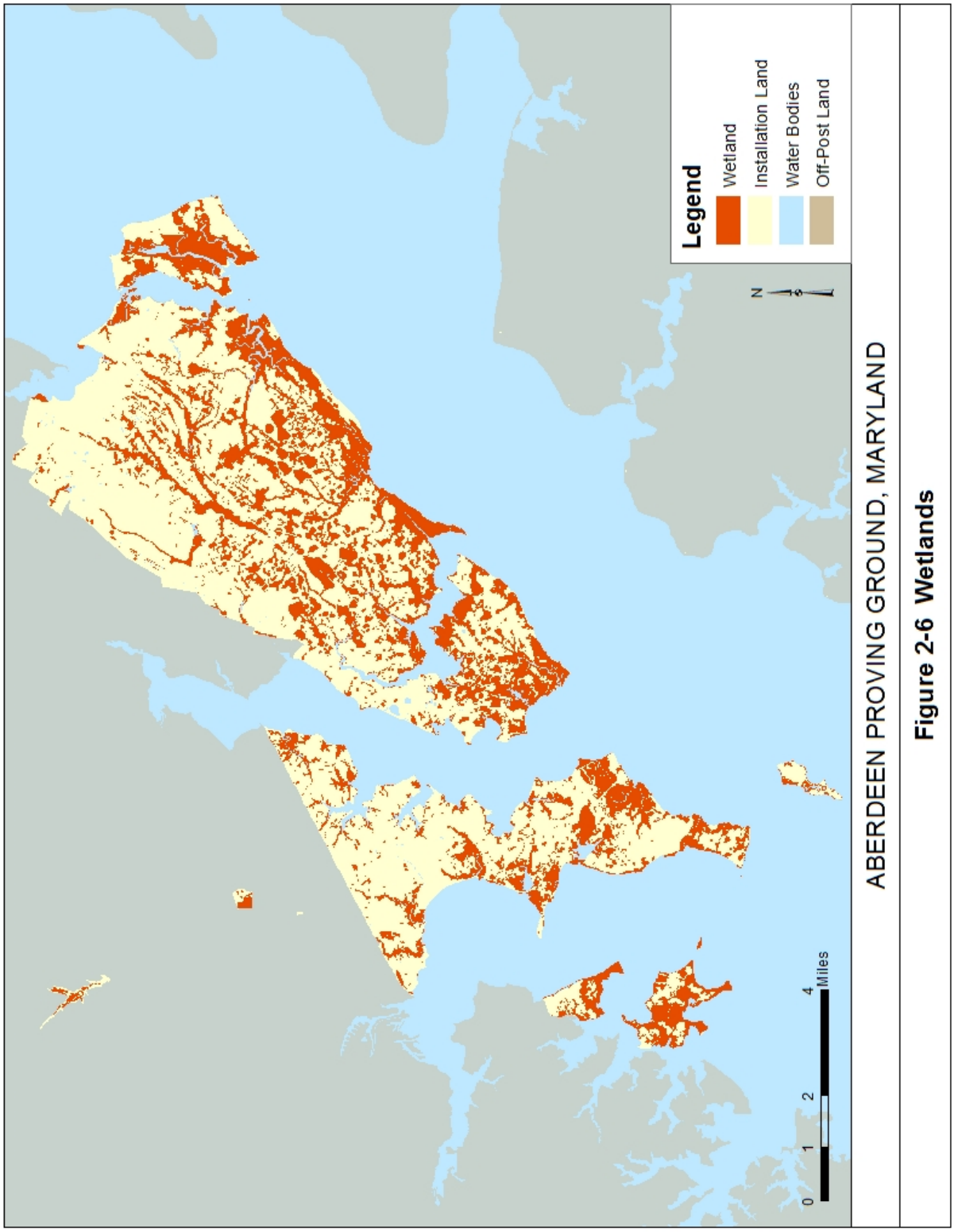


Figure 2-6 Wetlands

activities. Broad estimations of wetland boundaries can also change due to evolving technologies (better infrared aerial photography).

Wetland field delineations are funded by activity proponents for development projects. Recently, the delineations have been conducted by contractor personnel or the USACE Planning Division. An installation-wide wetland delineation has not been conducted at APG due to the extensive acreage, UXO hazards and accessibility, cost, and the 5-year validity of a delineation.

2.6.6 Flora and Vegetative Communities

2.6.6.1 Upland Areas

Approximately 36 percent of the total APG acreage is comprised of upland areas. Upland areas are dominated by forest vegetation, but also include fields, maintained lawn/landscaped areas, and developed areas (buildings and roads). Upland plant communities on APG are primarily mixed deciduous forests, meadows and grasslands, and monocultures of lawn grasses.

Before the government acquired the lands for APG, most of the lands (as much as 90 percent) were farmland, with approximately 3,000 acres of forests in 1917. Today, these lands contain well over 18,000 acres of forest, a 6-fold increase from pre-military use days. However, forests on APG are largely discontinuous and fragmented by numerous watercourses, wetlands, open fields, development, and roads. Stands vary in size from less than 1 acre to several hundred acres, and are primarily located in the restricted areas of the installation. Natural forest regeneration is occurring, often with an initial population of pioneers of sweetgum or red maple establishing early, then gradually oak, hickory, and other hardwoods dominating as the forest matures. Proliferation of sweetgum and other invasive plant species have contributed to declines in quantity and quality of interior forest habitat. Species diversity is also limited by heavy deer browsing. A listing of flora species known to occur on APG is provided in Appendix B.

2.6.6.2 Invasive Vegetative Species

Several invasive flora species exist on the installation. The most obvious invasive plant is common reed (*Phragmites australis*) which is a perennial grass associated with wetlands that is widespread on APG. Common reed is a native species, but once it colonizes a disturbed area, it takes over rapidly. Purple loosestrife (*Lythrum salicaria*) is an emergent aquatic plant of Eurasian origin that is also present on APG. Other significant invasive plant species at APG include the aquatic plants hydrilla (*Hydrilla verticillata*) and Eurasian watermilfoil (*Myriophyllum spicatum*); Japanese stiltgrass (*Microstegium vimineum*) which is a major forest understory invasive; the woody vine Japanese honeysuckle (*Lonicera japonica*); and shrub species like multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), and Japanese barberry (*Berberis thunbergii*). Sweetgum (*Liquidambar styraciflua*) is prevalent on APG and is a native, but highly invasive, tree that hinders mission and ecological balance.

2.6.6.3 Threatened and Endangered Plants

A survey for rare, threatened, and endangered vascular plants was last conducted in 1998 and 1999 (Steury 1999). Site surveys were conducted at APG twice a month from April through October. Voucher specimens were collected and deposited at the Smithsonian Institute's National Herbarium. No federally listed species were discovered during the study, but 62 vascular plant species listed as Maryland rare, threatened, or endangered were found. A listing of these plant species is provided in Appendix B. Of the 62 state-listed species found, 42 were associated with wetland habitats and 20 were found on dry to mesic soils. Carroll Island and Spesutie Island collectively contained populations of 32 percent of the state-listed species identified. Several plant species have since been removed from Maryland listing.

2.6.7 Fauna

APG is home to more than 300 species of birds, mammals, reptiles, and amphibians, along with commercially important fish species. Species can be found in both the cantonment areas and the restricted areas; however, the greatest diversity is found in the less developed restricted areas. The fish and wildlife on APG are a State resource, and fall under the jurisdiction of MDDNR. A listing of fauna species known to occur on APG is provided in Appendix C.

2.6.7.1 Mammals

At least 24 species of mammals are found on APG. Most species are found in the less developed restricted areas, while some have adapted quite well to living in the cantonment areas in proximity to human activities. APG workers and residents are reminded to enjoy animal sightings from a distance and to not approach or feed wild animals. Red foxes, coyotes, and white-tailed deer are easily habituated to humans and are commonly seen around developed areas. There continues to be the potential for adverse human-animal interactions with these species.

A survey for bats was conducted in 2011 and 2017 using acoustical monitoring devices. Six species were detected on APG: little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), tricolored bat (*Perimyotis subflavus*), hoary bat (*Lasiurus cinereus*), ~~and~~ eastern red bat (*Lasiurus borealis*), and silver-haired bat (*Lasionycteris noctivagans*).

2.6.7.2 Birds

APG is situated along the Atlantic Flyway, a major bird migratory route. It is estimated that up to 250 species of birds may occur at APG throughout the year. Coupled with its diverse habitats and large expanses of undeveloped land, APG's location makes it particularly important for a number of bird groups including waterfowl, colonial water birds, raptors, neotropical migrants, and forest interior dwelling species (FIDS). APG's larger forest stands (100 or more contiguous acres) and riparian forests (width of at least 300 feet) provide valuable FIDS habitat. APG's forested, open upland, and open water habitats provide raptors with nesting, foraging, and roosting areas. Many waterfowl species utilize APG's open waters, tidal marshes, beaver ponds, and ephemeral pools as breeding, foraging, and wintering habitats. Important colonial water

bird habitats at APG include tidal marshes and other wetlands, shallow waters along shorelines, and riparian forests isolated from human disturbance.

The North American Bird Conservation Initiative defines Bird Conservation Regions as ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. APG is located in the "New England/Mid-Atlantic Coast" Bird Conservation Region. Based on this ecoregion, an installation-specific species list was compiled that includes USFWS Birds of Conservation Concern, federally-listed species under the Endangered Species Act, state-listed species, candidate species (both federal and state), DoD Mission-Sensitive Priority Species, and other species protected under the Migratory Bird Treaty Act. The species list was further refined based on species ranges and available habitats on the installation. The Canada goose and the mute swan were removed from the list, because these are considered nuisance species on APG. The resulting list of priority bird species for conservation management that have potential to occur on APG is included in Appendix D.

2.6.7.3 Amphibians and Reptiles

At least 24 species of amphibians and reptiles occur on APG. Most of the species inhabit streams, ponds, wetlands, and forests. Amphibians are highly sensitive to environmental contaminants and diseases on land and in water, and are considered an indicator species for ecosystem health. In 2013, APG conducted an investigation into the presence of chytridiomycosis, a lethal skin disease in amphibians. A number of frogs from the headwaters of Romney Creek were swabbed for the chytrid fungus (*Batrachochytrium dendrobatidis*). One swab tested positive for the chytrid fungus; this sample was collected at the GATE EUL site.

2.6.7.4 Finfish and Shellfish

The waters of APG provide quality habitats that support at least 27 species of fish, including several species of high commercial and recreational importance. Fish commonly encountered include freshwater and anadromous species. Anadromous fish are those that live in saltwater and migrate to freshwater to spawn. Catadromous species migrate from freshwater to saltwater to spawn. One catadromous species, the American eel, can be found in APG waters. Marine species such as the bluefish (*Pomatomus saltatrix*) are occasionally reported in APG waters, but are only expected to be found during periods when low flows from tributaries reduce freshwater input, allowing higher salinities to occur.

Within APG waters, blue crabs (*Callinectes sapidus*) are likely the most important shellfish from a socioeconomic and ecological perspective. Blue crabs are one of the most important commercial and recreational fisheries in the Chesapeake Bay, are major predators of benthic communities, and are prey for many finfish species. Blue crabs can be found from the mouth of the Chesapeake Bay to tidal fresh waters that include portions of APG waters. The population of blue crabs in the Chesapeake Bay has fluctuated significantly during the past decade. Reasons include the natural life cycle of

crabs, harvest levels, and cycles in climate/current patterns that affect crab reproduction.

2.6.7.5 Nuisance Animals

A wildlife species that frequently comes into conflict with people can be considered a nuisance species. The animal may damage property such as buildings or public parks, or may threaten human health or safety by spreading diseases, by direct attacks, or by accidental collisions with vehicles. A nuisance species can also threaten the habitat and survival of other wildlife. A nuisance species can be a native or non-native (introduced) species. APG recognizes seven species as nuisance animals:

- American beaver (*Castor canadensis*).
- Canada goose (*Branta canadensis*)
- Mute swan (*Cygnus olor*)
- Turkey vulture (*Cathartes aura)* and Black vulture *(Coragyps atratus)*
- Northern snakehead (*Channa argus*)
- Zebra mussel (*Dreissena polymorpha*)

It should be noted, that other wildlife species (e.g., red fox, coyote, white-tailed deer) can potentially become a nuisance, on an individual basis, if humans intentionally or un-intentionally feed them. In accordance with Maryland state law, APG community members are not allowed to feed wildlife without a permit issued by the MDDNR. The only exceptions are backyard wild bird feeders. However, even bird feeders can attract opportunistic wildlife like foxes, coyotes, and deer looking for an easy meal. The DoO Conservation Law Enforcement Branch enforces “no wildlife feeding” in accordance with Code of Maryland Regulations 08.03.02.05 (“… a person may not…bait or feed wildlife without a use permit…”). Further discussion of APG’s management of nuisance animals is provided in Section 4.9.5.

2.6.7.6 Threatened and Endangered Animals

Animal species relevant to APG that are currently listed or are under a review process for potential listing are presented below in Table 2-2. Further discussion of APG’s management for threatened and endangered species is provided in Section 4.8.

2.6.8 Resources of Special Interest

There are specific natural resources that make APG unique among U.S. Army installations. These resources of special interest are all based on APG’s location on the Chesapeake Bay.

2.6.8.1 Chesapeake Bay Estuary

The Chesapeake Bay is the nation's largest and most important estuary. Including its numerous rivers and streams, the Chesapeake Bay watershed covers 64,000 square miles in Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and the District of Columbia. The Bay's unique blend of fresh and saltwater habitats is home to more than 3,600 species of plants and animals. About 17 million people live in the watershed and depend on the Bay and its tributaries for drinking water, food, power,

Table 2-2. Federal and State Listed Animal Species Relevant to APG

Category	Common Name	Scientific Name	Location	Federal Listing	State Listing
Fish	Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	On-site	Endangered	Endangered
Fish	Shortnose Sturgeon	*Acipenser brevirostrum*	On-site	Endangered	Endangered
Bird	Eastern Black Rail	*Laterallus jamaicensis jamaicensis*	On-site	Threatened	Endangered
Bird	Short-eared Owl	*Asio flammeus*	On-site[(a)]	None	Endangered
Mammal	Northern Long-eared Bat	*Myotis septentrionalis*	Contiguous	Threatened	Threatened
Insect	Rusty-patched Bumble Bee	*Bombus affinis*	Contiguous[(b)]	Endangered	Endangered
Fish	Maryland Darter	*Etheostoma sellare*	Contiguous[(c)]	Endangered	Endangered
Mammal	Little Brown Bat	*Myotis lucifugus*	On-site	Under Review	None
Mammal	Tricolored Bat	*Perimyotis subflavus*	On-site	Under Review	None
Reptile	Northern Red-bellied Cooter	*Pseudemys rubriventris*	On-site	Under Review	None
Reptile	Spotted Turtle	*Clemmys guttata*	On-site	Under Review	None
Insect	Monarch Butterfly	*Danaus plexippus*	On-site	Candidate	None
Reptile	Wood Turtle	*Glyptemys insculpta*	Contiguous	Under Review	None
Fish	Chesapeake Logperch	*Percina bimaculata*	Contiguous[(d)]	Under Review	Threatened

(a) Transient species during migration
(b) Historic contiguous presence, but likely now gone
(c) Historic contiguous presence in Deer Creek and Swan Creek, but likely now gone
(d) Historic contiguous presence in Deer Creek, but likely now gone

recreation, and jobs. From an ecological standpoint, the Chesapeake Bay has enormous value and serves multiple purposes including: 1) providing habitat to various wildlife including nursery beds for blue crabs and fish, 2) filtering run-off through extensive shoreline marshes and wetlands, 3) minimizing flooding and storm surges by buffering wave action with marshes, and 4) providing commercial fisheries to support local economies.

Activities within the Bay watershed, including those on APG, have the potential to directly and indirectly affect the health of the Chesapeake Bay. Federal and state regulations exist to protect this fragile ecosystem, namely the Chesapeake Bay Watershed Agreement, the EO 13508 (Chesapeake Bay Protection and Restoration), and the Maryland Enforceable Coastal Policies. APG's wetlands and forests are significant Bay resources and contribute beneficially to the health of the northern Chesapeake Bay. APG management actions that support the Chesapeake Bay are detailed in the specific natural resources program areas in Section 4.

2.6.8.2 Bald Eagles

APG has played a significant role in the regional recovery of the bald eagle (*Haliaeetus leucocephalus*). APG attracts a disproportional number of eagles in the northern Chesapeake Bay, because the installation has largely undeveloped forested shorelines with abundant food resources in the surrounding rivers and Bay. In addition, many of these shoreline areas have restricted access with little human activity. These shorelines provide optimal habitat for foraging, roosting, and nesting bald eagles. Residential and commercial development of surrounding shorelines in the northern Chesapeake Bay continues to drive an increasing number of eagles to APG. Further discussion of APG's management for the bald eagle is provided in Section 4.9.4.

Bald eagle
(Photo by Katherine Whitmore, USFWS)

2.6.8.3 Great Blue Heron Rookeries

The great blue heron (*Ardea herodias*), the largest heron in North America, is a colonial nesting bird that is common year-round in the Chesapeake Bay. APG supports multiple great blue heron rookeries, the largest of which is on Pooles Island. The Pooles Island rookery is the largest in the Chesapeake Bay with an estimated 1,450 pairs according to a 2013 survey (CCB 2013). Other smaller rookeries are found at Black Point, Gull Island, Woodrest Creek, and Reardon Inlet. Like many species, great blue herons are susceptible to degradation and loss of their preferred habitat, specifically wetlands isolated from human activities. Further discussion of APG's management for migratory birds including great blue herons is provided in Section 4.9.3.

2.6.8.4 Submerged Aquatic Vegetation

Blue crabs are one of many species that benefit from healthy SAV beds (Photo by Jay Fleming)

Submerged aquatic vegetation (SAV) is a diverse group of rooted aquatic plants found in shallow water areas of the Chesapeake Bay. This group of plants performs a number of irreplaceable ecological functions, which range from chemical cycling and physical modification of the water column and sediments, to providing food and shelter for commercial, recreational, and ecologically important organisms. Since 1980, poor water quality, disturbance of SAV beds, and the alteration of shallow water habitats have contributed to the decline of SAV. The decline of SAV is commonly identified as one of the major ecological issues facing the Chesapeake Bay. The health of the SAV population is a direct indicator of the health of the overall Chesapeake Bay. Many shallow water areas around APG provide suitable habitat for SAV. The dominant species of SAV in APG waters include the non-native species, Eurasian watermilfoil (*Myriophyllum spicatum*) and hydrilla (*Hydrilla verticillata)*. Wild celery (*Vallisneria americana*) and water stargrass (*Heteranthera dubia*) are two native SAV species that are also found at APG. Further discussion of APG's management for SAV is provided in Section 4.5.1.4.

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3. MISSION SUSTAINABILITY AND INTEGRATION WITH ENVIRONMENTAL MANAGEMENT

Protection of the military mission at APG is inextricably linked to preservation of its natural environment. The military mission relies on large expanses of quality natural infrastructure to support the Army's ability to test and train as they fight, in real world environments. The size of APG, its location on the Chesapeake Bay, and the climate are the key characteristics of the installation that assist in the accomplishment of the military mission. The relatively large size of APG, including its open waters and air space, provides adequate safety distances, noise attenuation distances, and room to accommodate the facilities located on the installation. The framework of APG's natural resources provides a variety of testing and training scenarios. For example, shorelines and open water are used for boat training; forest cover is used as a natural barrier to wind effects on test scenarios; and the diverse land coverage is integrated into land navigation training. As a temperate climate, APG replicates approximately 80 percent of the world's environment, and is the Army's only temperate climate proving ground.

The Army's occupation of the lands and waters of APG has ultimately benefitted the area's natural resources. The military presence at APG has preserved the native ecosystems by preventing widespread development. Had the U.S. government not taken ownership of the land, both the Aberdeen and Edgewood peninsulas would undoubtedly be far more developed now, especially along the waterfronts. Development within the restricted areas of APG remains limited to scattered testing facilities and active ranges, and roads are primarily unimproved. Much of the installation land has been allowed to re-forest, providing riparian buffers that serve to stabilize shorelines and improve water quality. Shorelines, creeks, wetlands, and ponds exist largely in a natural un-altered condition. The natural character of the installation continues to make it a vital habitat for waterfowl, fish, bald eagles, deer, and many other animals and plants.

Use and development of the land at APG has, however, had some adverse effects on its natural resources. The clearing of areas and removal of trees for facilities and access roads has resulted in habitat fragmentation. Fragmentation impedes the natural travel corridors used by wildlife and has led to increased conflicts between humans and white-tailed deer, foxes, and coyotes. Habitat for FIDS decreases as forest stands become fragmented. Disturbed areas also support opportunistic, invasive plant species that can quickly dominate the disturbed area and extend into adjacent habitats, displacing native flora and fauna and contributing to a decline in quality of native habitat. It should be emphasized, however, that the fragmentation and loss of habitat due to military use is still probably much less than it would be had the area been left as agricultural farm lands, or developed for residential or urban use.

3.1 CLIMATE CHANGE

There are a number of challenges to the sustainment of the natural resources and military mission of APG. The most notable and far-reaching challenge is climate change and its impacts on the installation. There is now irrefutable evidence that global climate change is occurring. The scientific community points to climate change indicators as proof that climate change is real. Some of the effects of climate change, such as sea level rise and increased air and water temperatures, have already been recorded in the Chesapeake Bay region. Models suggest that air temperatures in the Chesapeake Bay region will increase 5 to 9 degrees Celsius (°C) by the end of the 21st century, resulting in corresponding rise in Bay waters of 2 to 6°C (Pyke 2008).

Scientists link the changes in climate to the increased greenhouse gases in the atmosphere caused largely by the burning of fossil fuels to generate electricity, heat and cool buildings, and power vehicles. Current and future emissions are expected to increase the levels of these gases in our atmosphere for the foreseeable future (USEPA 2012). The DoD has stated that climate change will play a significant role in shaping the future security environment. The 2010 DoD Quadrennial review states that, threatened by global climate change, operational readiness hinges on continued access to land, air, and sea training and test space (DoD 2010). The DoD has identified climate change as a direct threat to the national security of the U.S. Installations must effectively reduce climate vulnerability through resilience measures tailored to local threats and estimated consequences (ASA(IE&E) 2020). To this end, an on-line Climate Assessment Tool was developed by the USACE in 2020. This tool analyses potential threat scenarios including coastal and riverine flooding, drought, wildfire, desertification, permafrost thaw, and seismic and volcanic activity. It also summarizes major regional trends projected to occur (precipitation, temperature, flooding, and drought) and expected impacts to wildlife, vegetation, soils and sediments, and water quality. The assessments are based on a 30-year average (2020-2050, centered on 2035). The tool will continue to be updated with data input from National Climate Assessments. The USACE also developed an Army Climate Resilience Handbook (Pinson et al. 2020). The handbook and on-line tool provide a starting point for developing mitigation strategies for climate change to be considered in natural resources planning, infrastructure resilience planning, and master planning.

Global climate change is having a very real effect on the environment and the way people in Maryland live and work. Some examples of real and potential outcomes of climate change and the impacts to APG include:

- **There will be an increase in intensity and frequency of strong storms and hurricanes. These events will increase shoreline erosion and the influx of contaminants into the Chesapeake Bay.**

  Maryland has seen an increase in intense storm and hurricanes in recent years. The unprotected shorelines of APG are degrading annually; it has been estimated that APG is shrinking by 36 acres per year (Joseph Associates 2001). Operational impacts include loss of mission land, increased exposure to UXO,

and an overall degradation of the missionscape for Warfighter testing and training. These storms are expected to continue or possibly increase in frequency and intensity. APG is currently not keeping pace with ongoing shoreline erosion from both steady state erosion and storm damage. Funding is currently unavailable, or very limited, for this work.

An increase in strong storms and hurricanes will lead to an increase in flooding and stormwater runoff. This will significantly impact APG by damaging roads, pipes, and buildings, and overwhelming water treatment facilities. Increased runoff will contribute to the degradation of water quality and aquatic communities in the rivers and Chesapeake Bay.

- **Climate change will alter the distribution of species and habitats in Maryland.**

  Rising air and water temperatures, precipitation and salinity shifts, and sea level rise are all expected to impact the Chesapeake Bay region. The interaction of several of these climate change effects could impact the ability of plants and animals and their habitats to survive in the region. These impacts could potentially leave a pathway for new, invasive species to enter into the ecosystem.

  Sea level rise is anticipated to occur within the century and will have an adverse effect on bald eagle nests along the tidal reaches of APG. It is unknown as to the actual number of breeding pairs to be impacted, but water inundation will result in losses of nest trees and habitat buffer. Eagles will transition toward upland habitats which will likely increase opportunities for eagle disturbances where people and eagles are in close proximity.

  Temperature shifts will alter the growing seasons in Maryland, changing the available plant life. Summer is projected to begin earlier into the spring and extend longer into the fall. The timing of blooming of certain species will be altered and could have a cascading effect onto dependent animal populations. Warmer temperatures in the Chesapeake Bay will stress SAV, a key component of the Bay ecosystem, while sea level rise will threaten terrestrial plant species along the river and bay shorelines.

- **As temperatures rise, summertime drought conditions are projected to occur more often resulting in water sustainability issues for APG.**

  Climate change has the potential to significantly impact water supply, quality, and management priorities. During the summer months, water supply may become more stressed, as demand peaks during this time, particularly due to increased use of both agricultural and non-agricultural irrigation. The increased groundwater withdrawal, along with a rise in the waters of the Chesapeake Bay, could lead to saltwater intrusion into the groundwater aquifer. APG currently uses groundwater to supplement its water source.

- **Increased winter and spring precipitation will lead to flooding and a wash of nutrients into the Bay.**

  The cooler wetter spring, along with strong storm events, will result in an increase in nutrients washed into the Chesapeake Bay, fueling large algal blooms that cloud the water. Recent analysis by Kaushal et al. (2010) has shown the potential for larger pulses of contaminants to enter streams, rivers and the Chesapeake Bay due to land use change and increased climate variability: "In 2002, the mid-Atlantic region experienced record drought levels. In September 2003, Tropical Storm Isabel produced large amounts of rainfall in the Chesapeake Bay region and freshwater flow into the Chesapeake Bay was 400 percent above the long-term monthly average. Record drought conditions followed by a very wet year coincided with pulsed watershed nitrogen exports and one of the most severe zones of hypoxia, or 'dead zones,' reported in the Chesapeake Bay." As precipitation extremes increase, pulses of pollutants such as these are likely to change in amplitude, frequency, and duration, having many implications for the way these pollutants are managed through regulations such as TMDLs.

- **Global warming, and the associated sea level rise, has been well documented in the Chesapeake Bay region. This phenomenon may have a substantial effect on the sustainment of ranges at APG.**

  Along with erosion from normal coastal activity and increased storm events, sea level rise is accelerating APG's loss of land mass. Warming of the climate system is now evident in the Chesapeake Bay from observations of increases in average ocean temperatures and corresponding rising global average sea level. Over the past century, water levels in the Bay have risen about 1 foot due to both sea level rise and land subsidence. It is estimated that projected increases in global sea temperature will result in a water level rise of 2 to 5 feet by the end of the 21st century (Pyke 2008). Figures 3-1 and 3-2 show impacts of sea level rises for Aberdeen and Edgewood Areas, respectively, in 2-foot increments. Rise in the Chesapeake Bay water level will have a most profound impact on Spesutie Island.

  Sea level rise will also cause wetlands at APG to be lost faster than they will be able to migrate upland. At risk will be the wetlands ability to filter pollution, protect shorelines, and provide vital habitat for Bay species.

These environmental issues are generally beyond the control of APG natural resources professionals and the management actions discussed in this INRMP. However, there are actions that can be taken to minimize the effects of climate change on APG.

- Continue with shoreline protection projects as funding is available. The DPW Natural Resources Team will continue to search for funding mechanisms to complete shoreline protection projects.

- Incorporate Low Impact Design and Stormwater Best Management Practices into all projects. All projects completed at APG will follow the guidelines in the Low Impact Design policy to ensure APG and its mission minimize their impact on the environment.

- Continue moving forward toward the NetZero Water goals. The NetZero Water Program has set ambitious goals for reduction in potable water usage. Meeting these goals will make APG a more self-sustaining installation.

- Continue flora and fauna surveys. Knowledge of the populations of trees, plants, birds, fish, and other wildlife will be a good indicator of the health of the ecosystem.

3.2 ENCROACHMENT AND CONSTRAINTS

Encroachment is any factor that inhibits military readiness, including but not limited to the growing competition for land, airspace, waterfront access, and frequency spectrum. Encroachment is a significant challenge that must continually be addressed to sustain mission capabilities. This section addresses two types of encroachment: internal (within APG boundaries) and external (outside APG boundaries).

3.2.1 Internal Encroachment

3.2.1.1 Institutional Constraints

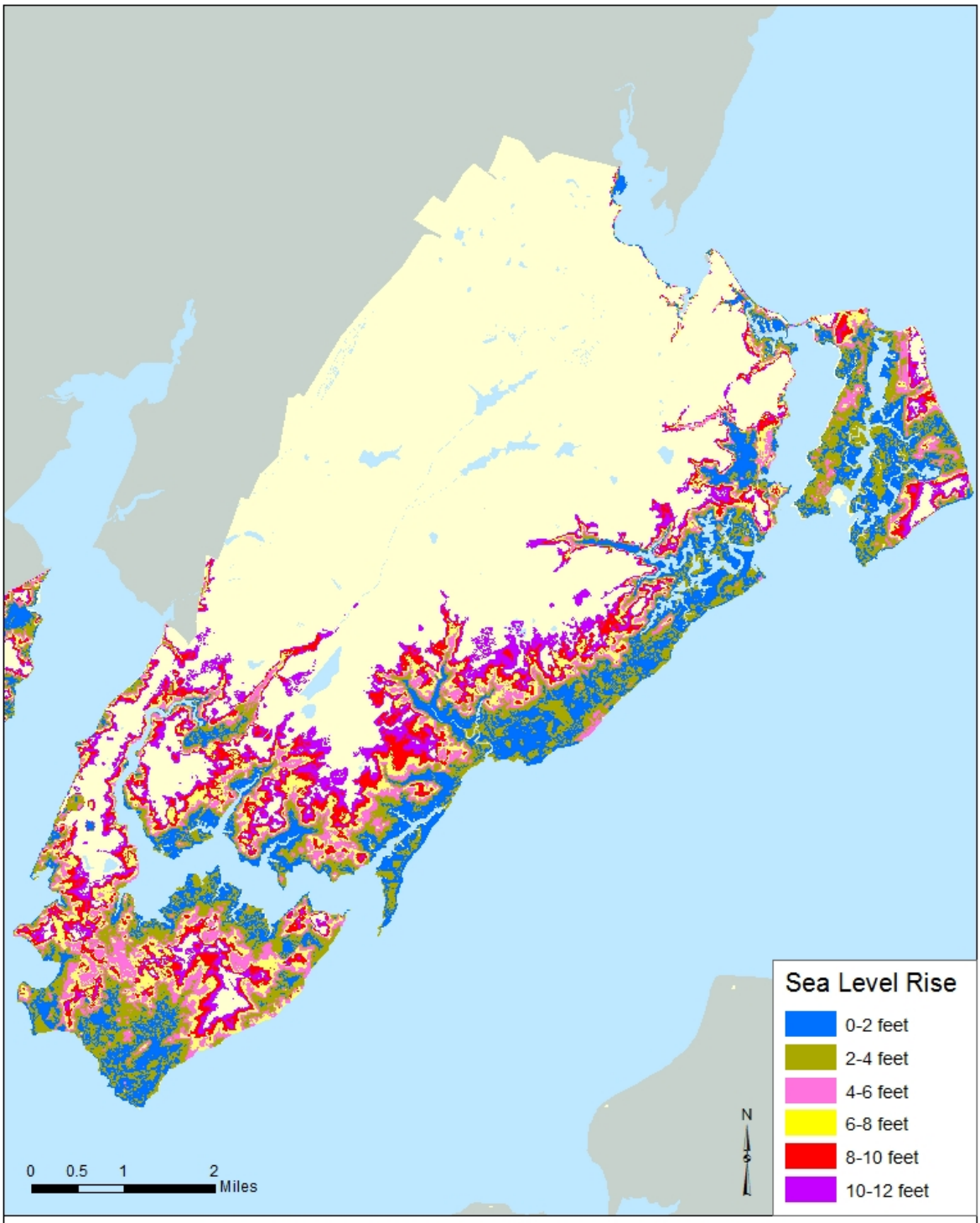
Institutional constraints are generally related to operations, infrastructure, and effects of past military operations that have resulted in constraints to current military missions.

- **Quantity Distance Arcs**

  Quantity Distance Arcs are areas encircling a certain quantity of explosive material. This area has restrictions on uses that can be within the arc. Mitigation for this type of constraint includes: removal, quantity reduction, relocation of the explosive material, or additional blast protection (such as berming) to reduce the size of the arc required. Most of the Quantity Distance Areas are located in restricted areas and are associated with specific missions.

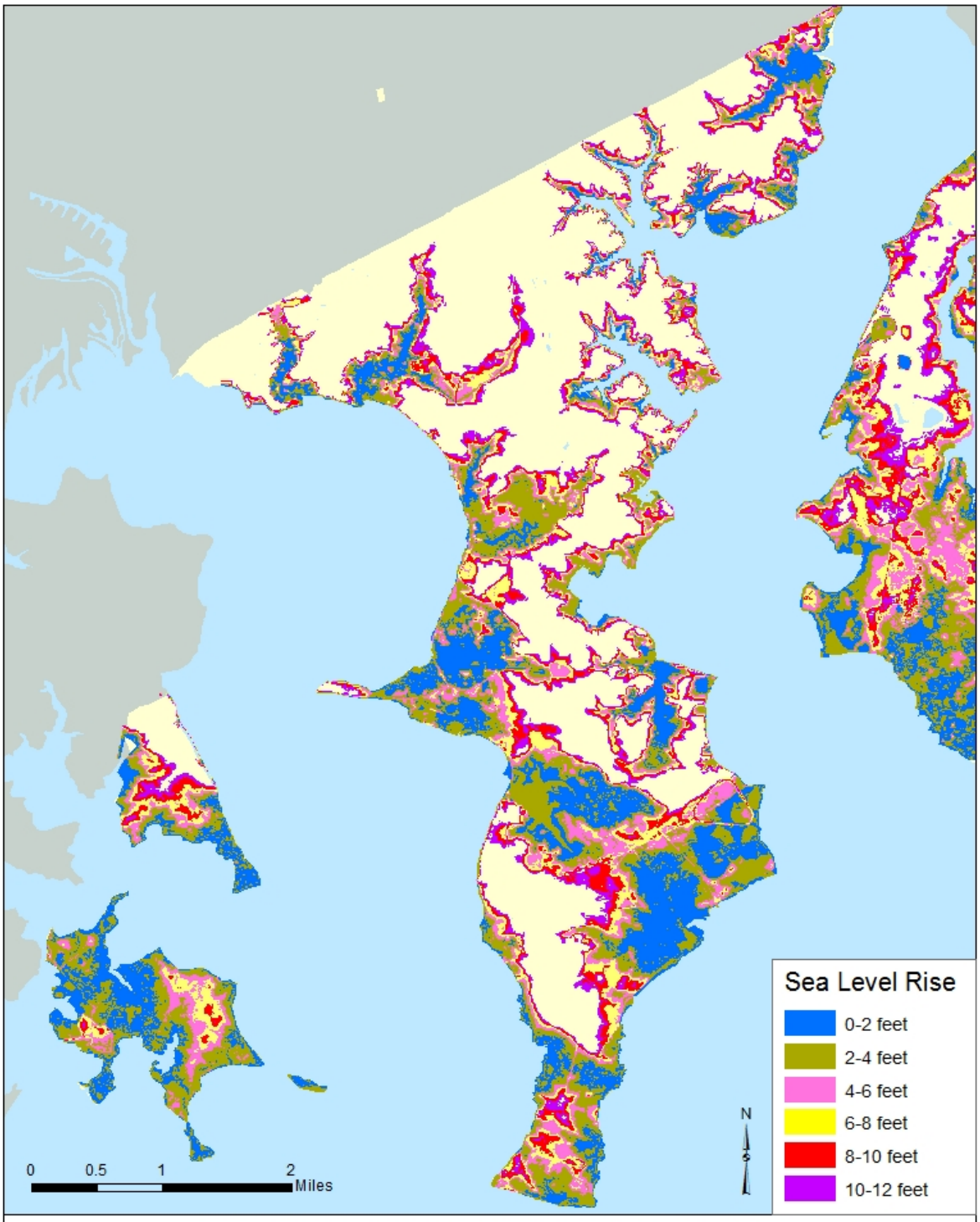
- **Anti-Terrorism/Force Protection (AT/FP) Requirements**

  APG's infrastructure and facilities must incorporate AT/FP considerations and techniques during planning, programming, design, and construction with consideration for sustainability and the environment. To respond to potential threats posed by terrorists, the DoD has developed minimum AT/FP standards for construction at military installations. These standards include minimum off-set distances from installation perimeters for occupied structures, minimum distances between parking areas and occupied structures, mitigation for head-on vehicle approach, and other standards. A wide variety of physical security countermeasures to include barrier systems, sensors, and random patrols by DoO Law Enforcement personnel are in place to prevent unauthorized access.



ABERDEEN PROVING GROUND, MARYLAND

Figure 3-1 Projected Sea Level Rise - Aberdeen Area



ABERDEEN PROVING GROUND, MARYLAND

Figure 3-2 Projected Sea Level Rise - Edgewood Area

- **Range Safety Fans**

  APG's test ranges have associated safety fans and surface danger zones to provide for the highest levels of safety and worker protection. Surface danger zones are the ground and airspace designated within the range (to include associated safety fans) for vertical and lateral containment of projectiles, fragments, debris, and components resulting from the firing, launching, or detonation of weapon systems to include ammunition, explosives, and demolition explosives. Safety fans and designated surface danger zones preclude activity and development within the area during testing.

- **Airfield Height Restrictions**

  Development around airfields is strictly managed in order to avoid conflicts with flight operations. PAAF and WAH have associated Clear Zones (CZs) that restrict the heights of structures and trees in these areas, and associated transitional surfaces which limit development in these areas.

- **Electromagnetic Radiation**

  APG is home to several communications-related tenants that operate communications equipment, including satellite communications equipment, that results in the emission of high energy radio frequencies and electromagnetic radiation. Radiation hazards from communications equipment can be categorized into three types: hazards of electromagnetic radiation to ordnance (HERO); hazards of electromagnetic radiation to fuel (HERF); and hazards of electromagnetic radiation to personnel (HERP).

  HERO occur in the form of high energy radio frequencies that create large induced circulating currents that can be of sufficient energy to activate the electro-explosive devices in nearby ordnance. The use of electro-explosive devices in ordnance has become an essential component of ordnance and at the same time, the power output and frequency ranges of radio and radar transmitting equipment have also increased. Procedures are established to control radiation from radio and radar antennas among personnel handling ordnance and personnel controlling radio and radar transmitters. HERP include the absorption of radiation and the potential for tissue damage among personnel working with or in close proximity to electromagnetic radiation. HERF result from combustible fuels that may be triggered by a spark generated by electromagnetic radiation. In addition, satellite communications equipment requires unobstructed "look angles" clear of terrain, trees, or buildings in order to link directly to a satellite.

  As a result, the presence of electromagnetic radiation producing equipment within areas of APG creates a constraint to development by requiring a buffer between sensitive receptors, fuel usage and storage areas, and ordnance development, testing, and storage areas.

- **UXO and Chemical Hazards**

  Munitions testing and historic operations have resulted in UXO presence in the soils and sediments of APG. The potential to encounter UXO is widespread across the installation. Addressing the UXO hazard requires having qualified explosive ordnance disposal (EOD) personnel sweep the project area prior to any ground access. UXO sweeps add significant cost to every natural resources project and military operation at APG. The project proponent is responsible for funding the EOD support. To facilitate natural resources management activities, APG requests annual funding for EOD support.

  Historical (pre-1970s) testing, training, manufacturing and disposal activities at APG have also led to numerous sites with chemically contaminated soil, sediments, groundwater and/or surface water. As a result, all of APG's Edgewood Area and portions of the Aberdeen Area are listed on the USEPA's National Priorities List (commonly referred to as the Superfund List) of hazardous release or potential hazardous release sites. APG and the Army signed a Federal Facilities Agreement in 1990 with the USEPA Region III; the Federal Facilities Agreement established a procedural framework and schedule for execution of APG's clean-up efforts. This agreement requires thorough investigations and responses to environmental impacts deemed necessary to protect public health, welfare, and the environment. Remediation and long-term monitoring efforts continue at APG and are a responsibility of the environmental restoration program; details of this program are not included in this INRMP.

3.2.1.2 Cultural Resources Constraints

Documented archeological investigations have been conducted at APG through amateur and professional efforts since the late 1930s. The Maryland Historical Trust (MHT) has on file 58 archeological sites located within APG. In addition, there are 17 potential sites recorded but not documented on Maryland Archeological Site Survey forms. The 58 MHT-noted sites include: ten prehistoric, nine with prehistoric and historic facets, and nine with a historic category (2008 ICRMP). The National Register of Historic Places (NRHP) does not currently list any of these 58 archeological sites in its inventory. APG has three structures listed in the NRHP; six areas (some with multiple buildings) eligible for listing; and six historic districts. Although some properties are listed, no property is currently designated as a National Historic Landmark.

Gunpowder Meeting House, one of three APG structures on the National Register of Historic Places

Development on APG needs to respect and consider the design of culturally protected resources. Development should avoid all noted archeological sites, buildings, historic districts, and cemeteries. Any proposed development encroaching upon archeological

and cultural resources should be evaluated for NRHP eligibility. Renovation of historic buildings is the preferred alternative to replacement of these resources with new structures.

In compliance with the American Indian Religious Freedom Act, Executive Order 13007 (Indian Sacred Sites), and DoDI 4715.03, APG must allow Native Americans access to installation sites and resources that are of religious importance, or that are important to the continuance of their cultures, subject to installation safety and security. Sacred sites and traditional cultural properties are identified at the discretion of federally recognized Native American tribes in consultation with APG's Cultural Resources Manager. There are currently no designated Native American sacred sites or traditional cultural properties on APG.

3.2.1.3 Natural Resources Constraints

APG's natural resources or the regulatory compliance of natural resources can constrain mission activities and capabilities. Given the location of APG on the Chesapeake Bay, the installation is faced with stricter and a greater number of environmental regulations than other Army installations in order to protect the sensitive Bay ecosystems. Compliance with environmental regulations to protect wetlands, forests, spawning fish, bald eagles, etc. increases mission costs and can potentially delay execution of mission projects. Obtaining federal consistency determinations, wetland permits, and/or re-designing project footprints to avoid impacts to eagles is time-consuming and a challenge, while APG attempts to remain responsive and adaptive to in-theatre needs in supporting the Warfighter.

Additionally, compensatory mitigation may be required as part of regulatory compliance for military operations which impact natural resources. Mitigation for wetland impacts and/or tree removal is the most common mitigation, though impacts to bald eagles may also require mitigation under specific circumstances. Suitable habitat for use as mitigation sites is becoming limited on the installation. Available acreage can be too fragmented or have the potential to conflict with current or future military operations. Ultimately, when installation land is designated for use as mitigation, the overall installation acreage available for future mission use decreases. Environmental mitigation is discussed further in Section 3.5. Constraints due to natural resources are summarized below:

- **Federal Consistency**

  APG must demonstrate consistency with Maryland's Coastal Zone Management Program. This "federal consistency" requires that APG actions which have reasonably foreseeable effects on any coastal use (land or water), or natural resource of the coastal zone, be consistent to the maximum extent practicable with the enforceable policies of Maryland's Coastal Zone Management Program. Federal consistency ensures the protection of Maryland's coastal resources including but not limited to wetlands, forests, water quality, floodplains, fish, waterfowl, and other wildlife.

In 2013, the State of Maryland and the DoD entered into a MOU to work together to protect and enhance Maryland's coastal resources. The MOU outlines how DoD facilities and projects will meet the federal law requirements of the Coastal Zone Management Act to ensure that their actions affecting these resources are consistent with State policies. The MOU is included in Appendix E.

- **Wetlands**

  Wetlands are managed to achieve a no net loss of nontidal wetland acreage and function, in compliance with the Clean Water Act and MDE Code of Maryland Regulations. No net loss is achieved by evaluating proposed development projects for impacts to wetlands. Development must first avoid wetlands to the greatest extent possible, then minimize unavoidable impacts, and lastly provide compensatory mitigation to off-set impacts. Compensatory mitigation is usually in the form of creation, restoration, or enhancement of nontidal wetlands, or by other methods such as monetary compensation if the former methods are not feasible. Depending on the size of the impacts, projects require either a Letter of Authorization or an individual permit from the USACE.

  Further discussion of wetlands management on APG is provided in Section 4.3 (Wetlands and Floodplain Management).

- **Migratory Birds**

  Migratory birds are protected under the Migratory Bird Treaty Act. This federal regulation covers nearly all U.S. native birds (whether migratory or resident), their parts, eggs, and active nests. Time of year restrictions may apply to certain activities and operations to avoid or minimize impacts to birds.

  Further discussion of migratory bird management on APG is provided in Section 4.9 (Fish and Wildlife Management).

- **Bald Eagles**

  Bald eagles are protected under the Bald and Golden Eagle Protection Act, in addition to the Migratory Bird Treaty Act. APG has a robust population of bald eagles that has the potential to impact military operations through collisions with power lines, structures, and vehicles, and through time of year and activity restrictions. Although APG utilizes adaptive management to address allowable activities in the vicinity of nests and roosts, there are still year-round restrictions on habitat alteration and seasonal restrictions on access and activities very close to nests and roosts.

  Further discussion of bald eagle management on APG is provided in Section 4.9 (Fish and Wildlife Management).

- **Threatened and Endangered Species**

  As more species are listed under the federal Endangered Species Act, there is growing potential that military mission may be restricted or delayed to avoid disturbance to threatened or endangered species (or their habitats). To avoid and minimize potential impacts, APG develops and implements appropriate species-specific conservation measures in consultation with the USFWS or NOAA. Measures may potentially include surveys and monitoring, habitat enhancement, or even time of year access restrictions in certain areas.

  Further discussion of management of threatened and endangered species on APG is provided in Section 4.8 (Threatened and Endangered Species Management).

- **Sweetgum Encroachment**

  Many of APG's individual range areas are immediately surrounded by grass fields and/or trees. Without regular grass mowing and tree trimming, these ranges can become compromised due to vegetative growth. At several ranges, sweetgum has intruded into the open range areas and hindered lines of sight for range operations. Regular maintenance has been hindered due to funding issues and safety concerns for UXO; some ranges have not been maintained for 8 to 15 years. A long-term landscape level plan of action is needed to delineate active range "boxes" and "lanes", and address required vegetative maintenance. The maintenance plan will likely include options for herbicide application, controlled burns, and mechanical clearing.

  Further discussion of sweetgum management on APG is provided in Section 4.1 (Forest Management) and 4.2 (Vegetation Management).

- **Shoreline Erosion**

  Surrounded by open water and with over 100 miles of shoreline, APG is very susceptible to shoreline loss due to natural erosion processes. Loss of shoreline equates to loss of mission land, and can eventually encroach on infrastructure and test ranges. Siting of a new project needs to fully consider the potential impacts from storm surges, wave action, and shoreline erosion. APG has stabilized some sections of eroding shoreline including parts of J Field, Abbey Point, Spesutie Island, Carroll Island, and Graces Quarters. However, there are many other shoreline areas that remain vulnerable.

  Further discussion of shoreline protection on APG is provided in Section 4.3 (Wetlands and Floodplain Management) and Section 4.5 (Chesapeake Bay Management).

3.2.2 External Encroachment

External encroachment can result from private and public development of off-Post land which results in incompatible adjacent land uses. Encroachment results in noise and

dust complaints from off-Post property owners; frequency and signal interferences; line of sight, air safety, and traffic conflicts; and range transients.

3.2.2.1 Noise and Dust Propagation

Off-Post development increases the number of receptors (persons) that could be affected by noise and dust from APG activities, increases the potential number of off-Post complaints, and may impair mission sustainability on APG. Military activities that have the greatest potential to generate noise and dust are vehicle operations (test tracks), aircraft flyovers, explosive detonations, and weapons firing. Road construction, road repair, and routine vehicular commuter traffic also generate noise and dust, but impacts are typically local to APG and do not extend past the installation borders. APG manages its noise through its Operational Noise Management Plan.

APG's noise contours extend off-Post into Harford and Baltimore Counties, and also across the Chesapeake Bay into Cecil and Kent Counties. A daily noise calibration shot is conducted to validate the noise prediction model. Atmospheric conditions such as wind speed, wind direction, temperature inversions, and other variables are factored into the model. Military operations are restricted to defined hours during weekdays and weekends in accordance with APG's operational noise policy. Any deviation from these hours to include federal holidays requires the approval of the ATC Range Commander and the APG Garrison Commander.

3.2.2.2 Frequency and Signal Transmission

Other sources of external encroachment include frequency and signal transmission. Depending on a structure's height and distance from APG, obstructions built within the radio frequency line of sight may have a significant impact to military operations at APG. For example, line of sight signal transmission between the Aberdeen Area and the Churchville Test Area can be potentially impacted from off-Post sources of ground-based signal interference. As Harford County continues to grow, there may be the possibility for taller structures to be built within APG's line of sight areas.

3.2.2.3 Line of Sight, Air Safety, and Traffic

Future urban development in areas adjacent to or within line of sight of sensitive APG mission areas poses a risk to APG mission sustainability. There is the potential for off-Post development to challenge on-Post AT/FP standards. For example, APG's Perryman Test Area is located adjacent to a track of developable off-Post land zoned for light industrial use. Should high density development be permitted across the fence line, there is concern that development might afford unfettered visibility of test track activities (and be subject to higher, persistent noise levels).

Likewise, future incompatible land uses adjacent to the Perryman Test Area can impact air safety at PAAF. Airfields have designated safety zones composed of CZs and Accident Potential Zones (APZ) that extend out from the ends of a runway. Development is a concern in these areas, because this is where aircraft accidents are statistically most likely to occur. The CZs at APG are within the installation boundaries, but portions of the APZs at PAAF extend outside the boundaries. The APZs are the

second most hazardous area associated with a runway. Because these areas do not have the same accident risk potential as the CZ, limited development is recommended within APZ I, with the least stringent land use recommendations in APZ II. It should be noted that although APG has only one active runway (Runway 4/22), safety zones are assessed for all active and inactive runways in the event that potential mission changes necessitate the reactivation of other runways.

Additionally, future off-Post development may challenge the adequacy of public infrastructure (i.e., roads), leading to traffic congestion. An example is evident with the traffic congestion that already besets most public transportation routes into and out of APG. Increased urban development reliant on these same routes could severely impair APG's future missions and operational readiness, particularly its missions/units that require rapid mobilization.

3.2.2.4 Range Transients

Due to the inherent dangers associated with the military mission, public access to APG waters is restricted and at times closed. During mission operations, APG patrol boats are positioned in restricted waters to prevent unauthorized entry. Entrance into or out of the restricted waters for navigational purposes during periods of mission operations may be permitted with proper coordination with Range Control. Granting entrance or exit clearances for these range transients can result in temporary delays or shutdowns to mission operations to allow for safe passage of the transient boat.

3.2.3 Encroachment Management

The foundation of Army operational readiness is highly trained soldiers with highly effective equipment. To conduct tough, realistic testing and training, commanders require continued access to critical ranges and training lands. Encroachment from population growth, urban development, and environmental requirements limits the Army's ability to fully utilize our installations for realistic combat training (Knott and Natoli 2004). Achieving "no net loss" in military mission capability is the underlying goal when managing encroachment. Management includes internal opportunities and external partnerships.

3.2.3.1 Internal Opportunities

There are areas on the installation where natural resources have little to no effect on the military mission, specifically Pooles Island, the southern portion of Graces Quarters, Carroll Island, and the Westwood area. There is potential for increased natural resources management in these areas, in the form of either sustainable habitat enhancement and/or environmental mitigation for mission activities. Use of these more remote areas for focused natural resource management actions, minimizes potential loss of operational mission areas for environmental mitigation, etc. In the Record of Decision for environmental restoration, both Graces Quarters and Carroll Island have a land use condition that restricts use of the land to primarily a limited-access natural resource management area (and secondarily for military/industrial activities).

Low impact development (LID) best management practices (BMPs) are used as a means to specifically manage stormwater in the face of development on the installation. In accordance with the Energy Independence and Security Act Section 438, federal facility projects over 5,000 square feet must "maintain or restore, to the maximum extent technically feasible, the pre-development hydrology of the property with regard to the temperature, rate, volume, and duration of flow." Careful planning in the design phase of development will limit the disturbance to the installation's natural resources as well as minimize the project footprint. APG has a LID policy. LID BMPs need to be incorporated into all construction projects to the maximum extent technically feasible.

Shoreline protection and stabilization reduces further loss of mission lands due to erosion, protects mission-essential infrastructure, and reduces excess nutrient contamination and siltation of the Chesapeake Bay. APG needs to continue to implement a shoreline protection plan. The objective of the plan would be to prioritize sections of shoreline based on range facilities, infrastructure, current and projected rates of shoreline loss, and develop strategies to protect the shorelines through a combination of living/biological techniques and off-shore hardened structures to diminish wave action and support natural beach accretion.

3.2.3.2 External Partnerships

- **Army Compatible Use Buffer Program**

  One of the primary vehicles for managing external encroachment is the Army Compatible Use Buffer (ACUB) program. The ACUB program is part of the DoD's Readiness and Environmental Protection Integration (REPI) program. The ACUB program allows Army installations to work with partners to encumber off-post land to protect habitat and buffer military operations without acquiring any new land for Army ownership. Through ACUB, the Army reaches out to partners to identify mutual objectives of land conservation and to prevent development of critical open areas adjacent to, or ecologically adjacent to, the installation. The Army can contribute funds to the partner's purchase of easements or properties from willing landowners. These partnerships preserve high-value habitat, limit incompatible development in the vicinity of military installations, and with changes in the FY21 National Defense Authorization Act, protect installation and range operations and infrastructure from predicted or unexpected environmental conditions. Establishing buffer areas around Army installations limits the effects of encroachment and maximizes land inside the installation that can be used to support the installation's mission.

  APG has two ACUBs. The first ACUB was approved in 2006 to protect the Churchville Test Area from potential encroachment. Churchville Test Area is located in a section of Harford County that was once an isolated agricultural area, but has since experienced accelerated population growth and housing development. Most of the existing land adjacent to the test area was already protected through state and county land preservation programs. However, a 164-acre parcel of land adjacent to the northern boundary of the test area

remained vulnerable to potential residential land use. Development on this land would have likely resulted in restrictions on the Churchville Test Area due to the generation of dust, noise, and vibration. In early 2007, Harford Land Trust purchased an easement on the 164-acre parcel of land with the assistance of military funds. Harford Land Trust leveraged military funds against the county's Agricultural Preservation Program to create a win-win-win solution for the Army, the land trust, and the landowner. The one-time, one-parcel ACUB project at the Churchville Test Area proactively addressed the growing concern that an incompatible land use could impact the future viability of the military test track.

APG's second ACUB was approved in 2012 and targets encroachment along the Chesapeake Bay within APG's operational noise contours. Operational noise generated from the testing and training missions at APG is often heard by off-Post residents. The objective of this ACUB is to work with local, non-profit conservation partners (Harford Land Trust; Eastern Shore Land Conservancy) to purchase conservation easements and secure fee-simple purchases to limit incompatible land development within APG's prioritized noise contours. Additionally, the ACUB provides the potential for APG to secure off-Post conservation credits for water quality, coastal zone management effects and wetlands, while increasing APG's resilience in the face of changing climate conditions. This ACUB also supports the DoD in meeting the goals of EO 13508 to restore and protect the Chesapeake Bay. The priority areas targeted by the ACUB were revised slightly in 2016 based on further analyses including parcel size and established land use, and to provide a better defined end-state. The Chesapeake Bay ACUB program proposal and map of updated priority areas are included in Appendix F.

- **Joint Land Use Study**

  Another vehicle to address and manage encroachment issues is the Joint Land Use Study (JLUS) program. The DoD's Office of Economic Adjustment (OEA) administers a Compatible Use Program which promotes cooperative planning efforts among military installations and surrounding communities. The OEA provides technical and financial assistance to state and local governments to plan and implement a JLUS, a strategic plan with specific implementation actions to ensure civilian growth and development are compatible with vital testing, training, and other military operations. The JLUS process promotes and enhances civilian and military communication and collaboration, serves as a catalyst to sustain the military mission, and promotes public health, safety, quality of life, and economic viability of a region. A JLUS attempts to mitigate existing compatibility issues, facilitate the prevention of future issues, and improve coordination between the local communities and the military installation (Matrix 2015). The JLUS is conducted in a collaborative manner involving all stakeholders, including local elected officials, planning commissioners, local military installation command staff, community business leaders, chambers of commerce, homebuilders, real estate interests, and affected residents. The JLUS planning area or district is defined by the jurisdiction(s) conducting the

JLUS in consultation with the military and participants serving on a JLUS policy advisory committee. Generally, the planning district includes the areas surrounding the military installation that are influenced by military operations.

The Army nominated APG as a JLUS candidate. In May 2012, the OEA conducted a site visit with APG and its tenants, and met with local officials from the surrounding communities. As a result of this initial visit, the OEA provided a favorable assessment for the need of the JLUS for APG and the community. APG's JLUS brought together stakeholders from the installation, Harford County, Cecil County, Kent County, the City of Aberdeen, and the City of Havre de Grace. The JLUS study identified compatible land uses and growth management recommendations within and adjacent to APG, and generated a "tool box" to assist decision makers in resolving compatibility issues. The final report for APG's JLUS study was released in November 2015 and is included in Appendix G. With the development of a full-working partnership for managing encroachment, the goals and objectives of this INRMP will be incorporated into planning documents where appropriate.

- **Privatization and Partnerships**

  The Army continues to look for opportunities to engage with outside entities to leverage resources and expertise, improve efficiencies and cost savings, and form synergistic relationships for the betterment of the installation and the surrounding community. Partnerships can combine resources (monetary or in-kind) to achieve a common goal and objective. Examples of existing APG partnerships or privatizations are the Residential Communities Initiative, the electrical utilities privatization, and the EUL program.

  APG is working with the USACE Baltimore District, the USACE Philadelphia District, Harford County, and GreenVest (non-governmental organization) on a potential partnership for Pooles Island. This potential partnership would use Pooles Island as a site for the beneficial re-use of clean dredged material provided by the USACE Philadelphia District. The placement of dredged material would re-establish the historic shoreline of the island, stabilize the shoreline against further erosion, protect the historic lighthouse, protect the significant bald eagle and great blue heron habitat, and create an area that could be used for environmental mitigation. Further discussion of the Pooles Island partnership is provided in Section 3.5.

3.3 INTEGRATION WITH OTHER PLANS

An INRMP must be coordinated with the installation's master plan to ensure that natural resources management activities are consistent with short and long-range installation planning. Army installations are required to maintain a Real Property Master Plan (RPMP), in accordance with AR 210-20. The RPMP documents an installation's comprehensive planning process and consists of five components:

- RPMP Digest – encapsulates the essence of the RPMP

- Long-Range Component – contains focused, detailed planning strategies that guide the long-range use of land and facilities

- Installation Design Guide – prescribes the design character of the installation by setting guidelines for future projects

- Capital Investment Strategy – contains the holistic set of actions needed to create the Real Property Vision

- Short-Range Component – marks the transition from planning to programming and provides the list of projects planned over the next five to seven years, as recognized by Headquarters, Department of the Army (HQDA).

Coordination between APG's natural resources managers and installation planners will occur at least annually during internal evaluations of the INRMP.

APG's INRMP is also prepared in coordination with APG's cultural resources management plan, pest management plan, installation restoration plans, and other INRMP component plans. The INRMP does not function as a comprehensive compilation of detailed information of all these plans, but rather summarizes the interrelationships with these plans.

An INRMP should also be coordinated with the Integrated Training Area Management (ITAM) program. The ITAM program is a core program of the Army's Sustainable Range Program and is responsible for maintaining the land to help the Army meet its training requirements. ITAM funding can be requested for natural resource management activities that support training areas. However, availability of ITAM funding is generally limited to training installations, and is of limited availability to APG.

APG is developing a Sustainable Range Vegetation Management Plan. The Sustainable Range Vegetation Management Plan will identify current range and training land assets (including range "boxes" and "lanes") and future requirements to ensure the long-term viability and continuity of APG's testing and training ranges. The INRMP will be coordinated with the Sustainable Range Vegetation Management Plan.

3.4 NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) was signed into law on January 1, 1970. The purpose of NEPA is to include environmental consideration into Federal agency planning and action. NEPA requires the evaluation of reasonable alternatives to a proposed action, an unbiased presentation of direct, indirect, and cumulative impacts of implementing the proposed action, and solicitation of public input. The Council on Environmental Quality developed federal regulations (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508) to complement and implement NEPA. These regulations required Federal agencies to create their own NEPA implementation procedures. The Army's procedures are documented in Title 32 CFR Part 651 – Environmental Analysis of Army Actions (formerly AR 200-2). Title 32 CFR Part 651

provides guidance and procedures for complying with NEPA and for integrating environmental considerations into Army planning and decision making.

APG's NEPA program is administered by the DPW Environmental Division – NEPA Program Manager. Proponents are encouraged to engage in the NEPA process early in the planning stages of a proposed action. Early NEPA coordination and analysis can identify consultation requirements and associated mitigation costs that can be potentially avoided or minimized. As stated in Title 32 CFR Part 651.14(a): "the Army goal is to concurrently integrate environmental reviews with other Army planning and decision-making actions, thereby avoiding delays in mission accomplishment."

3.4.1 Levels of Documentation

Proposed actions that may potentially impact the environment are evaluated to determine the need for and appropriate level of NEPA documentation. The level of NEPA documentation is determined by reviewing the proposed action against the screening criteria and categorical exclusions found in Title 32 CFR Part 651. There are three levels of NEPA documentation, each level with increasing degree of complexity and coordination:

- **Level 1, Record of Environmental Consideration (REC)**

  A REC is the simplest form of NEPA documentation. A REC is a signed statement that documents that the proposed action or project has received environmental review, has met the screening criteria, and is covered by at least one categorical exclusion. According to APG's NEPA policy, a REC is required based on criteria in Title 32 CFR Part 651, or for any activity that involves maintenance or renovation activity on structures that are historic or have undetermined historic status; intrusive activity (digging); or the outdoor use of munitions, explosives, energetic materials, etc.

- **Level 2, Environmental Assessment (EA)**

  An EA is required if the proposed action or project does not pass the screening criteria. EAs are prepared for projects with possible significant impacts to the natural environment and/or human health. An EA discusses the need and purpose of the proposed action, alternatives for implementing the proposed action, an analysis of the environmental impacts for each alternative, and a conclusion of recommended course of action. An EA requires a 30-day public comment period. If the EA concludes that there are no significant impacts with the recommended course of action, then an associated Finding of No Significant Impact (FONSI) is prepared and the proposed action proceeds. If the EA cannot conclude in a FONSI, then the next level of NEPA documentation is required.

- **Level 3, Environmental Impact Statement (EIS)**

  An EIS is required for a major Army action or project that will have significant adverse environmental impacts. The EIS process begins with the public release of a Notice of Intent, stating the need for an EIS. The EIS is a NEPA document

that includes an extensive analysis of the proposed action and the alternatives. An EIS requires a 45-day public comment period. Public meetings are generally required as part of the EIS process, and the EIS culminates in a Record of Decision (the final decision for the proposed action).

3.4.2 NEPA and the INRMP

An EA (APG 2009) was conducted for APG's INRMP when the plan underwent a major revision in 2009. The EA evaluated the potential environmental effects associated with the implementation of the revised INRMP. The EA was made available to the public for a 30-day comment period.

Additional NEPA documentation is not required for this current INRMP, because only minor changes were made in updating the plan. These changes are not expected to require natural resources management practices materially different from those described in the previous INRMP.

3.5 CONSULTATION REQUIREMENTS

This INRMP programmatically addresses natural resources management on APG, and is coordinated through the USFWS and the MDDNR for their concurrence. However, there are still instances when management actions or mission activities require consultation or coordination with external regulatory agencies or other groups. These specific actions may fall outside the broad scope of the INRMP, or may fall under a legal authority other than the Sikes Act (e.g., Bald and Golden Eagle Protection Act, Endangered Species Act, Clean Water Act, etc.). All consultation and coordination with external regulatory agencies or groups is conducted by the DPW Natural Resources Team, or by the DPW Cultural Resources Manager (for cultural resources).

- **Bald Eagles – USFWS**

  APG coordinates with the USFWS, as required by the installation's bald eagle incidental take permit. Coordination includes reporting of all bald eagle injuries and mortalities, submission of monitoring reports and surveys, and cooperative permit reviews or "check-ins". Coordination with the USFWS is also required for actions that impact bald eagles and which fall outside the scope of the installation's eagle take permit. For example, authorization to remove a nest may be granted by the USFWS, but would require advance review and coordination, and an additional or amended permit.

- **Threatened and Endangered Species – USFWS, NOAA Fisheries Services**

  APG consults with the USFWS on actions that may impact federally-listed threatened and endangered species found on APG. To date, except for the formerly listed bald eagle, APG has only consulted informally with the USFWS on listed species, namely the northern long-eared bat. Until the absence of the northern long-eared bat on APG can be confirmed, APG will operate under the Installation Management Command (IMCOM) 2015 programmatic consultation (USAEC 2015). Future listings of other species will require consultations with the USFWS.

APG consults with the NOAA Fisheries Services with regards to sturgeon management. APG will continue to update/amend its sturgeon management program as more and relevant data becomes available.

- **Wetlands – USACE, MDE**

  APG coordinates with the USACE and the MDE for wetlands impact authorizations and permits.

- **Federal Consistency – MDE, MDDNR, Maryland Department of Planning**

  For federal consistency determinations, APG coordinates with the MDE, MDDNR, and the Maryland Department of Planning (for historical and archeological sites) as outlined in the 2013 MOU (Appendix E).

- **Cultural Resources – State Historic Preservation Office, Tribal Governments**

  The DPW Natural Resources staff coordinates internally with its Cultural Resources staff to ensure that natural resource management actions are conducted in accordance with the APG Integrated Cultural Resources Management Plan, and in compliance with federal and state historic preservation laws. For example, actions may require archaeological surveys prior to ground disturbance, consultation with the Maryland State Historic Preservation Office (SHPO) for impacts to historic structures, or consultations with tribal governments. For tribal government consultations, APG engages ten Native American tribes: Cayuga Nation of New York, Delaware Nation (Oklahoma), Oneida Nation of New York, Oneida Tribe of Indians of Wisconsin, Seneca Nation of New York, Seneca-Cayuga Tribe of Oklahoma, Onondaga Nation of New York, Tonawanda Band of Seneca Indians of New York, Tuscarora Nation of New York, and St. Regis Band of Mohawk Indians of New York. Tribal governments are consulted as part of the NEPA process at the time of INRMP revisions, and at other times as warranted. All consultations with the SHPO and tribal governments are conducted by the DPW Cultural Resources Manager.

3.6 ENVIRONMENTAL MITIGATION

APG is a complex Army installation that must remain responsive and adaptive to immediate in-theatre needs of the Warfighter. Sustaining the mission results in challenging and often conflicting issues between natural resources management and mission requirements. Among the many challenges are limited funding and manpower, wide-spread presence of UXO hazards, and fragmented ecosystems due to institutional complexity. These challenges can be especially constraining when evaluating environmental mitigation options for proposed projects.

Mitigation is a means to offset damage to the environment. The first step in mitigation is to avoid adverse impacts on the natural resources by siting the proposed project in an area where natural resources will not be impacted. Avoidance mitigation is becoming

increasingly difficult on APG, because of the extensive wetlands, forests, and bald eagle nests and roosts, and the limited availability of developable land.

The next step in mitigation is to minimize the impacts to the natural resources by limiting the degree or magnitude of the action, through timing or location of the proposed project. For example, a project footprint may be re-drawn so as to minimize the amount of wetlands or trees to be impacted, or construction activities may be scheduled to occur outside of bald eagle nesting season. Minimization mitigation will reduce the severity of the impacts, but likely not avoid all impacts, and consideration needs to be given to the overall effects of the proposed project on the ecosystem.

The last step in mitigation, after avoidance and minimization have been implemented to the extent practicable, is compensation or in-kind replacement of the affected natural resources. Replacement can occur on-site or at another location, and involves the restoration, creation, enhancement, or preservation of the same type or better quality habitat. In certain cases, in-lieu fees may also be an option for replacement mitigation, where a fee is paid.

3.6.1 Environmental Coordination

With regards to project development, impacts to natural resources, and mitigation, it is important that APG operates under a single environmental program. Proponents are encouraged to engage Garrison environmental subject matter experts early in the planning stages of a project through submission of a REC or other appropriate NEPA documentation. The NEPA process identifies environmental constraints, potential mitigation requirements, and need for regulatory consultation or authorization. It is APG policy that all communication with federal, state, and local regulators on APG-related programs, projects, and operations is conducted by personnel from the Garrison (DPW) Environmental Division. For all natural resource management projects, issues, and mitigation, the DPW Natural Resources Team initiates communication with outside environmental authorities.

3.6.2 Site Selection

Mitigation needs to fulfill the improvement of the impacted natural resources and the sustainment of the military testing and training mission. This can be challenging when state or federal guidance emphasizes on-site mitigation, while DoD guidance stresses off-site mitigation. As indicated in AR 200-1, wetlands mitigation should, whenever possible, be sited within the same watershed as the impacted wetlands AND outside installation boundaries, so that installations can retain maximum land-use flexibility. APG has designed and constructed several large wetland mitigation projects on the installation, including three mitigation sites on Carroll Island which is an area that is geographically isolated and not heavily influenced by mission operations. In the past few years, the Maryland Department of the Environment (MDE) and the USACE have provided the flexibility of meeting mitigation requirements at off-Post sites located in APG watersheds. These particular off-Post mitigation sites are located in Baltimore County and are managed by Ecotone, Inc.

Flexibility is also incorporated into the MOA between APG, the Maryland Critical Area Commission, and the MDDNR Forest Service for comprehensive forest mitigation. This MOA (Appendix H) allows APG to focus its forest mitigation on managing and improving existing forested lands for the military missionscape (rather than converting un-forested mission lands into new mitigation areas), thereby eliminating the approach of mitigating in parcels and fragments.

To alleviate the constraints of on-site mitigation, both the USEPA and DoD allow the use of an approved off-site mitigation bank or in-lieu fee vehicle. Off-site mitigation or in-lieu fee may provide a preferred alternative to meet watershed protection and ecosystem goals and meet future mission requirements. An off-site mitigation bank or in-lieu fee can consolidate small, fragmented mitigation projects into one large contiguous site which can result in greater watershed or ecosystem-level benefits. Additionally, an off-site mitigation bank or in-lieu fee avoids costs to the Army from on-site UXO remediation plus long-term management and maintenance of the mitigation site.

APG's Chesapeake Bay-focused ACUB can potentially provide sites for off-site mitigation and/or mitigation banks. MOAs and/or Intergovernmental Service Agreements would need to be established between APG and relevant regulators to establish the crediting systems. Depending on the parcel and existing habitat, ACUB could potentially provide off-site mitigation for wetlands, trees, bald eagles, and threatened/endangered species. Based on positive feedback from the Maryland Critical Area Commission in 2016, APG is working towards a MOA with the Maryland Critical Area Commission to formalize a forest retention crediting system for ACUB parcels.

Another option for fulfilling environmental mitigation requirements is to identify a large on-site area which can be used for multiple mitigation efforts. Like Carroll Island, Pooles Island is isolated and relatively undisturbed by mission operations. Since the early 1880s, Pooles Island has lost approximately 100 acres of land mass due to natural shoreline erosion. A comparison of the 1846 historic shoreline to that of present day shows greatest shoreline loss along the northern and western portions of the island. While there has been less shoreline loss along the eastern side of the island, portions of the eastern shoreline are still susceptible to low to moderate loss (up to 8 feet per year). Projection models for sea level rise predict that half of Pooles Island will be inundated at high tide by 2040 and completely inundated by 2100. APG is working to develop a partnership with outside entities to leverage funding, resources, and innovative technologies in an effort to restore the island and stabilize the shoreline, thereby reducing the impacts of sea level rise. The goals of the island restoration effort would be to protect the historic lighthouse, protect the significant bald eagle and great blue heron habitat, and create an area that could be used for environmental mitigation, while preserving a unique mission landscape. Additionally, re-establishment of the historic shoreline and land mass could potentially offer increased buffering of wave action which could reduce shoreline loss on the Edgewood peninsula. Tentatively, the partnership would involve the USACE Baltimore and Philadelphia Districts, Harford County, and GreenVest (non-governmental organization), to beneficially re-use clean dredged

material from the C&D Canal. Pooles Island would provide the USACE Philadelphia District an additional placement site for the dredged material using minimal containment structures, stone revetments, wetland creation, and reforestation to maximize the amount of dredged material to be used and the amount of shoreline to be stabilized. The engineering designs would be provided by the USACE Baltimore District. Thorough evaluations of any dredged materials and proposed placement sites would be needed to ensure that resulting placement would be environmentally sound and not restrict or impede military mission. As of May 2016, this investigation is still in the preliminary data gathering stage with no secured funding sources yet identified. An additional benefit of this strategy is that if successfully implemented at Pooles Island, then the strategy can be replicated at other sites on the installation, to stabilize eroding shorelines that are critically connected with mission operations (e.g., Taylor Island, Spesutie Island, etc.).

3.6.3 Out-of-Kind Mitigation

Another consideration as a mitigation alternative is using out-of-kind mitigation. Out-of-kind mitigation is a special type of compensatory mitigation in which the adverse impacts to one habitat type are mitigated through the creation, restoration, or enhancement of another habitat type. As with other mitigation strategies, out-of-kind mitigation requires consultation with the relevant regulators. APG has not yet implemented this type of mitigation.

3.6.4 Long-Term Management

When a site is selected for use as a mitigation site, the long-term management of the site must be considered. Once established, a mitigation site must be maintained to ensure the continued viability of the resource. Follow-up monitoring is used to determine whether the mitigation project is on track to meet ecologically-based performance standards. After performance standards have been achieved, continued management is required to ensure the long-term sustainability of the resource, including long-term financing mechanisms. APG needs to budget for recurring long-term mitigation management as on-site mitigation projects are completed.

Future military missions may require that completed mitigation sites be used for purposes other than mitigation. In such cases, the completed mitigation site may be relocated and compensated, but the costs may be prohibitive. In accordance with the forestry MOA, the completed mitigation may be relocated and replaced on a 2:1 basis while mitigation for the new site activity(s) will also be addressed. This provides APG with some flexibility for sustaining the military mission.

3.7 REGIONAL INITIATIVES

On May 12, 2009, President Barack Obama signed EO 13508 (Chesapeake Bay Protection and Restoration) that recognizes the Chesapeake Bay as a national treasure and calls on the federal government to lead a renewed effort to restore and protect the nation’s largest estuary and its watershed. EO 13508 includes several components to address the restoration and protection of the Chesapeake Bay:

- shared federal leadership, planning, and accountability
- restoration of Bay water quality
- agricultural practices to protect the Bay
- reduction of water pollution from federal lands and facilities
- protection of Bay as the climate changes
- expansion of public access to the Bay and conservation of landscapes and ecosystems
- monitoring and decision support for ecosystem management
- protection and restoration of living resources

EO 13508 renews the on-going efforts by the Chesapeake Bay Program and its partners to restore the Chesapeake Bay. The Chesapeake Bay Program is a regional partnership that brings together leaders and experts from a wide range of agencies and organizations. Partners include, but are not limited to, the governors of Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia; mayor of D.C., chair of the Chesapeake Bay Commission, and USEPA administrator. Each partner uses its own resources to implement Bay restoration and protection activities. Partners collaborate through the program's teams, workgroups, and committees to share information and set goals. The DoD is one of many partners in the Chesapeake Bay Program.

3.7.1 DoD Chesapeake Bay Action Team

To facilitate collaboration among its installations located within the Chesapeake Bay watershed, the DoD formed a Chesapeake Bay Action Team. APG participates in these quarterly conference calls.

3.7.2 Army Chesapeake Bay Strategy

The Army operates 19 major installations within the Chesapeake Bay watershed, and therefore, is a significant landholder in the Bay region. The purpose of the Army Chesapeake Bay Strategy is to integrate conservation and protection efforts for the Chesapeake Bay into the Army's national defense activities in partnership with governmental entities, non-governmental organizations, and the community. The Army Chesapeake Bay Strategy is a science-based action agenda that reflects adaptive management principles and contributes to the long-term recovery of the Chesapeake Bay. The Army signed the Chesapeake Bay Strategy in 2009. The strategy contains five goals and associated objectives and targets to address nutrients, toxics, and sediment reduction; habitat and living resources protection; community outreach and engagement; and stormwater management and partnerships. The five goals are based on the priorities established in the 2008 Chesapeake Action Plan, the DoD Chesapeake Bay Strategic Action Plan, and EO 13508. The five goals are:

1. Contribute to restoring and sustaining the water quality of the Chesapeake Bay and its tributaries

2. Restore and sustain living resources and healthy habitats on Army installations

3. Support the implementation of ecosystem-based fisheries management
4. Strengthen stormwater management practices and maintain healthy watersheds
5. Foster Chesapeake Bay stewardship

APG has conducted numerous natural resources projects that support the Army Chesapeake Bay Strategy. Examples of projects include finfish surveys, water quality monitoring, benthic sampling, and SAV plantings. An on-going collaborative project is the SAV monitoring study conducted by the Virginia Institute of Marine Sciences (VIMS). Each year, VIMS scientists collaborate with state, federal, and private businesses to collect aerial photographs of SAV habitat. APG's DPW Natural Resources Team coordinates with Range Control and APG Security and Intelligence to allow VIMS to complete a photographic overflight of APG waters. Due to security concerns, APG maintains possession of the photographs, edits out all installation land features, and provides the redacted images back to VIMS for SAV mapping. Inclusion of APG waters in VIMS' study contributes to a complete evaluation of SAV beds and provides a more accurate assessment of SAV health in the upper Chesapeake Bay.

3.7.3 Maryland – Chesapeake Bay TMDL

In support of the TMDL program and efforts to improve the water quality of the Chesapeake Bay, the seven jurisdictions with the Bay watershed created individual Watershed Implementation Plans (WIPs). A WIP addresses ecological restoration and sustainability while allowing for greater transparency and accountability for improved performance. The WIP documents how the jurisdiction will partner with federal and local governments to achieve and maintain water quality standards. The MDE developed its Phase I WIP in 2010, and its Phase II WIP in 2012. APG provided data and input into Maryland's WIP. In updating APG's INRMP, consideration is given to making sure APG's natural resources management actions are in alignment with the Army mission and also support the goals of Maryland's WIP.

3.8 STATE WILDLIFE ACTION PLAN

A State Wildlife Action Plan (SWAP) is funded by federal monies, known as the State Wildlife Grants Program. These funds, distributed through the USFWS from an annual appropriation by the U.S. Congress, are designed to address development and implementation of programs that benefit wildlife and their habitats. A State must have a SWAP in order to receive funding from the State Wildlife Grants Program. The USFWS mandates a 10-year revision to the SWAP.

The MDDNR revised its SWAP in 2016 under a 10-year USFWS mandated revision. The plan is a collaborative effort between state, federal, tribal, and local conservation partners. The plan identifies wildlife species of greatest conservation need, their key habitats, analyzes the variety of threats or stressors to the species and their habitats, and determines and prioritizes conservation actions needed to address the threats. The success of this plan depends on collaboration from conservation partners, academic institutions, municipalities, and the public.

3.8.1 Species of Greatest Conservation Need and Priority Actions

The Maryland SWAP has an extensive list of species of greatest conservation need including 41 mammals, 143 birds, 26 reptiles, 19 amphibians, 31 finfish, 272 insects, and 78 other invertebrates. Additionally, the SWAP identifies 751 species of rare and uncommon plants.

3.8.2 Key Wildlife Habitats

Key habitats are those that support the species of greatest conservation need. The Maryland SWAP identifies 10 broad habitats:

- Forests
- Coastal beaches and dunes
- Groundwater wetlands
- Streams and rivers
- Subterranean
- Glades, barrens, and cliffs
- Floodplain wetlands
- Tidal wetlands
- Bay and ocean
- Other

These habitats are further delineated into 59 key habitats, finer ecoregions based on vegetation, substrates, and surface water characteristics.

3.8.3 Threats to Species and Habitats

The Maryland SWAP identifies numerous threats to the species of greatest conservation need and their habitats:

- Land conversion
- Habitat fragmentation
- Residential and commercial development
- Agriculture and aquaculture
- Energy production and mining
- Transportation and service corridors
- Biological resource use
- Human intrusions and disturbances
- Natural system modifications
- Invasive species and other problematic species, genes, and diseases
- Pollution
- Geological events
- Climate change

3.8.4 Conservation Actions

The Maryland SWAP identifies seven types of overarching statewide conservation actions. These conservation actions, along with some APG natural resources management actions that support these SWAP conservation actions, are listed below:

- Land and water acquisition and protection
    - APG ACUB: Land conservation to protect habitat and buffer military operations
- Law and policy
    - APG Conservation Law Enforcement: Dedicated staff to enforce natural resource protection laws

- Direct management of natural resources
    - APG Forest Management: Enhancement of forest stands with emphasis on native species and control of invasive species
    - APG Wetlands Management: Protection of wetlands to include mitigation to off-set unavoidable impacts
    - APG Storm Water Management: Management of stormwater run-off to reduce nutrient and sediment loads into surface waters
    - APG Low Impact Development: Management of stormwater run-off through conservation and use of on-site natural features to protect water quality
    - APG Mute Swan Management: Partnering with MDDNR to control mute swan population on installation

- Planning and administration
    - APG NEPA: Analysis of installation activities and operations to determine potential impacts to natural resources and conservation measures to avoid or minimize impacts
    - APG Land Use Planning: Integration of installation land use planning with other regional land use plans and initiatives

- Data collection and analysis, inventory, monitoring and research
    - APG Forest Management: Inventorying of forest stands for habitat and mission sustainability
    - APG Bald Eagles: Surveying of bald eagle population to evaluate population size and annual productivity since de-listing
    - APG Reptiles and Amphibians: Provided data input (species sightings) into the Maryland Amphibian and Reptile Atlas, a 5-year joint project funded by State Wildlife Grants (2009-2014)

- Education, outreach, and technical assistance
    - APG Outreach: Participation in educational outreach events both on and off-Post to foster appreciation of natural resources

- Climate change adaptation
    - APG Climate Change Adaptation: Identification of vulnerabilities to climate change and actions necessary to address impacts

3.9 OTHER LAND USE PLANS

EO 13508 calls for renewed efforts to restore the Chesapeake Bay, and builds upon prior Chesapeake Bay Agreements under the Chesapeake Bay Program. In 2014, the Chesapeake Bay Watershed Agreement was signed by the Bay stakeholders. This agreement guides the work of the Chesapeake Bay Program, and the goals of the agreement help partners track the health of the Bay. Together, EO 13508, its

implementing strategy (2010 Strategy for Protecting and Restoring the Chesapeake Bay Watershed), and the 2014 Chesapeake Bay Watershed Agreement resulted in a number of subordinate strategies and plans including LandScope Chesapeake, Chesapeake Working Lands, Chesapeake Forest Restoration Strategy, Chesapeake Bay Watershed Public Access Plan, and GreenPrint.

3.9.1 LandScope Chesapeake

LandScope Chesapeake is a publicly accessible, geographic information watershed-wide land conservation priority system that resulted from a land conservation goal of the 2014 Chesapeake Bay Watershed Agreement. LandScope Chesapeake facilitates collaboration among state, federal, local, and non-government organization partners, and supports land conservation planning, decision making, and implementation throughout the watershed.

The 2014 Chesapeake Bay Watershed Agreement adopted a goal to protect an additional two million acres of lands throughout the watershed, currently identified as high conservation priorities at the federal, state or local level by 2025, including 695,000 acres of forest land of highest value for maintaining water quality. APG can support achieving this goal through its ACUB program. Additionally, APG can support the development of Landscope Chesapeake by providing appropriate GIS data, photographs, press releases, etc. as mission and security allows. Also, APG can continue to pursue collaborative projects with other installations to leverage funds for projects that support the land conservation (and other goals) of the agreement.

3.9.2 Chesapeake Working Lands Conservation Strategy

To support the land conservation goal of the 2014 Chesapeake Bay Watershed Agreement, the Chesapeake Working Lands Conservation Strategy focuses primarily on programs and partnerships that use easements and related tools to permanently protect private farm and forest land. This strategy highlights some of the federal easement programs that can be leveraged to achieve more acreage conserved on the ground, even though the programs have less funding compared to state programs. In addition to easements, the strategy highlights complementary programs and initiatives to support the stewardship and viability of working lands.

For example, Maryland's Rural Legacy Program uses a public-private partnership approach to preserve large, contiguous tracts of land and to enhance natural resource, agricultural, forestry, and environmental protection while supporting a sustainable land base for natural resource-based industries. Each Rural Legacy Area is initiated by local sponsors, such as land trusts or local governments, and designated by the state through an application process. Some of the criteria the state considers in reviewing applications include:

- Significance and extent of agricultural, forestry, natural, and cultural resources proposed for protection
- Threat to resources from development pressure and landscape changes

- Economic value of the resource-based industries or services proposed for protection
- Strength and quality of partnerships created for land conservation and the extent of matching funds

The importance of the other land use plans discussed in this section is the creation of avenues for APG to partner with other organizations that may have overlapping missions and goals. With recent changes in the Fiscal Year (FY)14 National Defense Authorization Act, DoD Readiness and Environmental Protection Integration (REPI) funds can be considered non-federal match for any conservation program of the U.S. Departments of Agriculture and the Interior. This allows APG and its partners to stretch funds to maximize conservation efforts. In addition, several of these plans in the Chesapeake Bay region recognize DoD's REPI program as integral to reaching the proposed milestones and goals. The Army's implementation of REPI, through the ACUB program, at APG directly supports these plans and the overall goals of EO 13508.

3.9.3 Chesapeake Forest Restoration Strategy

Recognizing the importance of forest restoration in restoring the Chesapeake Bay, the Chesapeake Forest Restoration Strategy was released in December 2012 as a supporting action of the implementing strategy for EO 13508. The Chesapeake Forest Restoration Strategy provides a roadmap to guide and expand forestry partnership efforts in the years ahead. Investments in these efforts will accomplish a number of far-reaching goals in improving the health of the Bay. The Strategy builds on earlier commitments by the Chesapeake Bay States and federal partners to restore riparian forest buffers at a rate of 900 miles per year and support community tree canopy expansion goals. Tree planting on rural and urban lands, including riparian forest buffers, is a cost-effective, long-term solution to meet Chesapeake Bay TMDL targets, while also improving stormwater management, air quality, wildlife habitat, carbon sequestration, and community quality of life. The Strategy promotes innovative and collaborative approaches to targeting restoration in areas of greatest opportunity and benefit, focusing on wildlife and fisheries habitat, mine lands, agroforestry, urban and community forestry, and contaminated lands.

APG's forestry actions directly support the Chesapeake Forest Restoration Strategy by promoting a sustainable forest through selective plantings and other enhancement activities. APG's ACUB program offers indirect support through its land conservation efforts. The high priority areas for APG's ACUB program include forested Bay shoreline areas. APG's ACUB efforts serve to prevent encroachment on the military mission, but can also secondarily and incidentally prevent the development of these critical riparian buffers that help protect the Bay's water quality.

3.9.4 Chesapeake Bay Watershed Public Access Plan

The implementing strategy for EO 13508 includes a goal to increase public access to the Chesapeake Bay and its tributaries by adding 300 new public access sites by 2025. The basis for this goal lies in the long-standing public demand for greater access to the

water in the Chesapeake Bay region. The strategy explicitly calls for the National Park Service, in conjunction with the watershed states and other federal agencies, to develop a public access plan to inform and guide expansion of Chesapeake watershed public access. Further, the strategy directs the plan to assess the demand for public access; describe (inventory) the existing public access facilities; assess barriers to public access; determine gaps in the public access system; identify opportunities for new access sites; and help direct federal, state, and local funding toward public access opportunities. The Chesapeake Bay Watershed Public Access Plan was released in January 2013.

Through both the ACUB and JLUS programs, APG can aid in achieving the goal for increased public access by selecting projects and recommendations which may allow for public access.

3.9.5 GreenPrint

Maryland's GreenPrint Program is an internet-based mapping system that helps to prioritize ecologically important land to protect. The program is a joint effort of the MDDNR, Maryland Departments of Planning and Agriculture, and Office of the Governor. The goals of the program are to: 1) identify using computer mapping techniques the most important unprotected natural lands in Maryland, 2) link or connect these lands through a system of corridors or connectors, and 3) save those lands through targeted acquisitions and easements. Several funding mechanisms for land conservation exist, including Maryland's Program Open Space and Maryland's Rural Legacy Program. APG can contribute towards the goals of GreenPrint through its ACUB program.

3.9.6 Local Comprehensive Community Plans

The surrounding counties of APG have comprehensive master plans or land use plans (Harford County 2012 Master Plan; Cecil County 2010 Comprehensive Plan; Kent County 2006 Comprehensive Plan; and Baltimore County Master Plan 2020). These plans will be considered in the JLUS for APG.

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4. NATURAL RESOURCES PROGRAM AREAS

This chapter provides overviews, management strategies, and actions for the natural resources program areas and support programs at APG. Separate management component plans exist for several programs; these component plans are cited where applicable in text and included in entirety as appendices to this INRMP. The programs included in this chapter are:

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4.1 FOREST MANAGEMENT

4.1.1 Background

APG is fortunate to have an expanding forest resource and recognizes the direct relationship between the Army mission landscape and natural resources stewardship responsibilities. Along with military mission as their number one priority, managers focus on forest health, biodiversity, ecosystem integrity, intrinsic wildlife values, water quality, aesthetics, and recreational opportunities.

Forest management at APG has grown along with the resource. Most of APG was predominantly farmland before its acquisition by the Army in 1917. Early maps of APG in the 1930's show a little over 3,000 acres of forest cover and reflect the agricultural land uses. Over time, the forest adjacent to mission testing and cantonment areas was allowed to naturally regenerate and mature on large expanses. The installation now has over 18,000 acres of forest cover. These forested areas have a fragmented distribution created by waterways, forested wetlands, wetlands, and numerous man-made disturbances. Forest stands on APG vary in size from less than an acre to several hundred acres. Maintenance mowing and range test activity fires have kept several thousand acres of APG in an early successional stage of forest development. UXO is a potential hazard throughout all APG forest stands.

The goals of forest management at APG, as outlined below, focus on creating and sustaining the forested testing and training natural infrastructure required by APG's numerous and diverse tenant organizations and activities. The natural infrastructure needs of APG's tenants varies with specific missions, but overall requires a mix of open areas and forested areas. Open areas are maintained for ground and aerial maneuvers and training, and also for munition impact areas. Forested areas are needed for on-foot soldier training and navigation maneuvers, and also for wind and visual barriers adjacent to testing and training areas. APG's Forest Management component plan of this INRMP (Appendix I) focuses on forest health, ecosystem biodiversity, regeneration, wildlife habitat, water quality, recreational opportunities, reduced wildland fire fuel load and opportunities for conservation compliance that minimize impacts on Army mission. Sound, landscape-level ecosystem management principles are implemented that support bald eagle management, FIDS bird communities, and habitat for many neotropical migrant bird populations, as well as other ecosystem services.

APG natural resource managers have taken a pro-active approach with tenant customers, regulators, and leadership in creating and sustaining the necessary testing and training landscape while simultaneously meeting compliance driven requirements.

4.1.2 Management Strategies and Actions

Strategy: Manage for forested areas in accordance with Forest Management component plan

APG's installation-wide Forest Management component plan is a landscape level approach with sound ecosystem focused forest management techniques associated with 578 individual forest stands. Recommendations are made for each of the stands over a 50 year period. Silvicultural prescriptions are currently specified for 203 of the stands based on Army mission requirements. The Forest Management component plan is updated annually based on forest inventory/management execution and mission changes. It promotes a natural infrastructure that integrates testing/training platform, forest health, wildlife habitat, recreational opportunities, and compliance credibility through landscape level ecosystem management. The plan considers the effects of its implementation and complies with the requirements established under the NEPA, Endangered Species Act, and the 2014 Chesapeake Bay Watershed Agreement.

- Action: Forest Management Plan Execution

  Budget for and execute specific silvicultural prescriptions outlined each FY in the Forest Management component plan through timber stand improvement projects, timber sales, prescribed burning, mechanical/chemical understory control, and stand opening inter-planting regeneration. The Forest Management component plan promotes healthy stand structure and a biodiverse native seed source. The forest stand prescriptions and GIS database are updated at project conclusion.

- Action: Forest Inventory and GIS database

  Continued improvement of the Forest Management component plan involves an updated inventory of forested areas on the installation. Army installations with forest resources are required to complete a forest inventory every ten years. APG is meeting this requirement through annual inventory projects that address portions of the installation's forest resources.

- Action: Establish Fixed Area Forest Inventory Plots

  APG is in the process of establishing fixed area forest inventory plots (as a GIS layer) that will provide future natural resource managers and range managers invaluable forest cover information. The plots will be inventoried (measured) every 10 years for multiple parameters including tree species composition, crown/mid-story/understory basal area and spacing, site index, regeneration of desirable tree species, invasive species, wildlife habitat, and occurrences of rare/threatened/endangered plant species. Data gathered from fixed area plots can be useful in forest management decisions, wildlife habitat analyses, and other resource management. The inventory can provide information on insect and disease trends or how the forest was affected by major environmental events

such as hurricanes or ice storms. Long-term measurements can also reveal potential effects of pollution and climate change on the forest environment.

Strategy: Leverage APG forest stewardship

APG is the second largest forested landowner in the state of Maryland with over 100 miles of Chesapeake Bay shoreline. Forest management that focuses on healthy, uneven-aged, mixed species forests with adequate natural regeneration is critical to improving water quality and riparian stabilization for the five watersheds of APG. State and federal regulators recognize APG's proactive natural resources stewardship actions, compliance with the Coastal Zone Management Act (and Maryland's Coastal Zone Management Program and its Enforceable Policies), and landscape-level approach that benefits the Bay. Currently, the forest is dominated by sweetgum, an aggressive colonizer of disturbed habitats and poorly drained sites. APG is managing for a future uneven aged forest composed of a mix of oaks, yellow poplar, sweetgum, hickory, and red maple with healthy regeneration.

- Action: Execute MOA with regulators quantifying APG forest management benefits

  Continue to execute MOA with the MDDNR Forest Service and Maryland Critical Area Commission that recognizes and quantifies APG's forest management initiative and action. Execution of this MOA limits the impacts of Coastal Zone Management Act compliance on limited mission landscape resources, by focusing forest mitigation on managing and improving existing forested lands rather than converting un-forested mission lands into new mitigation areas.

- Action: Initiate third-party certification of APG forest management

  Maximize market value for APG forest products that are determined to be available for disposal through a standardized audit process that recognizes and promotes sustainable forest management already taking place on APG. Sustainably managed forests make a vital contribution to society by providing economic, environmental and social benefits indispensable to our quality of life. Sustainable Forest Initiative principles include sustainable forestry, forest productivity and health, protection of water resources, protection of biological diversity, aesthetics and recreation, and protection of special sites.

- Action: Tree City, Tree City Growth, MD PLANT Outreach

  Recognition by national and state natural resource management organizations provides platforms for community outreach and education opportunities. Annual APG Arbor Day/Earth Day celebrations typically involve local schools, tenant activities, child development centers, and Garrison Command staff.

Strategy: Improve APG mission ecosystem biodiversity and sustainability

The patterns of forest spatial partitioning produced by mission activities will be managed to the extent possible to foster the biological diversity of both plants and animals. Forest management at APG will support biodiversity and provide healthy, uneven-aged forests with strong regeneration that sustains current and future Army mission needs. Any forest product disposal at APG will be determined by actions to improve forest health and mission sustainability. Forested wetlands will be preserved and enhanced where possible in accordance with the national "no net loss of wetlands" policy.

- Action: Jump-start natural regeneration biodiversity

  Years of deer over population, invasive species, and no fire disturbance have promoted the lack of natural regeneration at APG. Coastal plain, early successional species like sweetgum, quickly move in where mowing is curtailed. Forest floor scarification increases soil seed contact. Oak, poplar, hickory, and beech seedlings are tubed. Stands with quarter acre or larger crown openings are targeted for spot planting(s) as part of timber stand improvement or for forest mitigation.

- Action: Control early successional monocultures

  Wildlife food plots, formerly planted for wildlife management purposes, and areas formerly mowed for mission have reverted naturally to locally native early successional forest vegetation and provide quality habitat for native animal species. Seed consumption and heavy browse create sweetgum monocultures that left unmanaged, mature to overstocked and unhealthy forest stands. Mechanical removal, herbicide application (ground level or aerial), prescribed burning and/or a combination of the three are effective means to control early successional sweetgum monocultures while other silvicultural prescriptions may be required in older stands. Woody vegetation growing in defined range areas (range "boxes" and "lanes" to be determined and included in Sustainable Range Vegetation Management component plan), are managed through periodic clearcuts, and have no forestry mitigation requirement(s) if managed in accordance with Sustainable Range Vegetation Management component plan.

Strategy: Engage tenant activities

The NEPA review process is used as the primary mechanism to document and evaluate the effects of any project requiring forest product removal on the installation. Through the Conservation Subcommittee meetings, the DPW Natural Resources staff engages the tenants to discuss conservation issues and planning. Tenants are also part of the INRMP review process.

- Action: Develop and award requirements type forestry services contract

  Any and all activities (inventory, planning, timber stand improvement, site preparation, tree planting, construction, compliance, etc.) that impact APG forest

resources must be coordinated through the DPW Natural Resources Team. The Natural Resources Team has a contract vehicle that can support each of the tenant activities and the Garrison in any of the aforementioned areas as part of mission execution. This contract mechanism is firm-fixed-price, performance-based, and can accept funding from almost any APG tenant activity.

Strategy: Deposit forest product proceeds into Army forestry account

If forest product removal and/or disposal is a component of any action on APG, the Army will maximize merchantable value and deposit all proceeds into the Army forestry account.

- Action: Continue to capture merchantable value of timber removed for construction or storm damage

- Action: Initiate installation timber sales

  In unhealthy, over-stocked forest stands that call for selective thinning, maximize market value for APG forest products that are determined to be available for disposal. Proceeds deposited into the Army forestry account may be available for future APG forest management efforts.

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4.2 VEGETATION MANAGEMENT

4.2.1 Background

The purpose of vegetation management is to sustain APG's military missions through environmentally sound practices for landscaping, grass mowing, tree and shrub trimming, and vegetative clearing in the cantonment and restricted areas of the installation. When developing installation strategies for vegetation management, it is important to emphasize the sustainment of the military missions with regulatory compliance and ecosystem integrity. Basic considerations of aesthetic quality and viewsheds may also be considered, especially in cantonment areas.

4.2.1.1 Range Areas

APG developed a Sustainable Range Vegetation Management component plan to this INRMP (Appendix J). This component plan discusses the desired current and future vegetation conditions for testing and training ranges in the restricted areas; identifies lines of sight, firing boxes, and impact areas for vegetation maintenance; and addresses potential methods of implementation (mowing, chemical spraying, tree cutting, prescribed burning). The Sustainable Range Vegetation Management component plan facilitates on-going range sustainment efforts.

4.2.1.2 Landscaping and Native Plantings

Landscaping considerations generally apply to occupied buildings, residences, and common access areas (roadways, gate entrances, etc.). APG's Installation Design Guide (a component plan of the Master Plan) details the landscape design standards including selection, placement, and maintenance of plant material. As indicated in the Installation Design Guide, native plant material is to be used to improve the overall visual quality of the installation. Native plantings are also the foundation of "BayScape" landscapes. BayScapes are environmentally sound landscapes that benefit people, wildlife, and the Chesapeake Bay. BayScape advocates a holistic approach to landscaping through principles inspired by relationships in the natural environment. BayScape landscapes require less mowing, less fertilizing, and less pesticide use; help protect water quality; and provide diverse habitats for songbirds, small mammals, butterflies, and other animals. BayScape principles include:

- Planting water-loving trees, shrubs, and perennial plants along streambanks to protect streambanks from soil erosion
- Creating habitat diversity, such as a laid stone wall to provide habitat for small mammals
- Planting buffers of trees and shrubs as windbreaks, habitat corridors, and visual boundaries
- Planting trees to provide shade, reduce water runoff, and clean the air
- Planting groundcovers on areas that are sloped or rarely used to reduce maintenance and watering
- Planting islands of natural habitat within lawn areas to provide pockets of habitat and habitat diversity

4.2.1.3 Grass Mowing

Grass mowing resources (labor and funding) on the installation can vary from year to year, but are generally limited. Grass areas on the installation are prioritized for mowing based on several factors including safety, anti-terrorism/force protection, and aesthetics. The grounds immediately surrounding landscaped areas are generally maintained monocultures of grass lawns that are frequently mowed during the growing season. Road sides are also mowed frequently, while interior grass patches are allowed to grow taller. Grass areas in and around airfields and around ammunition magazines (igloos or bunkers) must be carefully managed for safety. Grass at airfields that is maintained either too short or too tall can lead to increased hazards to aircraft operations from wildlife intrusion (see Section 4.10). Tall grass around bunkers can compromise safe access and fire prevention.

Reductions in mowing could save grass cutting resources and promote ecosystem services, provided that mission and safety are sustained. Some portions of the cantonment areas and large portions of the restricted areas have open grass fields which are generally mowed infrequently. There is the potential for some of these grass fields to be converted to agricultural leases for hay cutting, while portions of other grass fields could be managed (or converted) for wildlife (e.g., grassland nesting birds, pollinator habitat).

4.2.1.4 Tree/Shrub Trimming and Removal

For landscape maintenance, any trimming or thinning of trees and shrubs should be restricted to removing no more than one-third of the plant in a single growing season, as indicated in APG's Installation Design Guide. Additionally, non-time critical trimming should be conducted outside of peak breeding bird season, unless a survey confirms the absence of nesting birds in the affected trees/shrubs.

Any tree and shrub trimming, thinning, or clearing in riparian buffers must be coordinated with the DPW Natural Resources staff. Riparian buffers are vegetated areas next to streams, rivers, and the Chesapeake Bay. These ecologically sensitive areas have high ecosystem value in protecting adjacent water resources from run-off and pollution, providing bank stabilization, and providing wildlife habitat.

4.2.1.5 Invasive Species

Invasive plant species (whether native or non-native) generally offer lower ecosystem services than native more beneficial plant species. Left un-checked, the proliferation of invasive plants can result in significant declines of native plant species. In cantonment and other landscaped areas, invasive vegetative species are avoided by selecting native tree and shrub species for new plantings. A list of recommended species compiled by the Natural Resources staff is available to project proponents and is included in APG's Master Planning documents. Regular mowing of landscaped areas also discourages the establishment of invasive species.

Some of APG's undeveloped upland areas are already populated with several invasive plant species including Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa*

multiflora), autumn olive (*Elaeagnus umbellata*), Japanese barberry (*Berberis thunbergii*), and Japanese stiltgrass (*Microstegium vimineum*). Control efforts are implemented during selective forest enhancement projects, and include mechanical removal and pinpoint herbicide application.

Common reed (*Phragmites australis*) is a native species but is considered invasive, because it can rapidly form dense stands which crowd out native vegetation. The reed has colonized wetlands on APG. Full eradication of the plant is impossible, but selective eradication in specific areas is required for ecological and wetland management reasons and for line of sight at several range areas. The technique for its eradication is well-established and straightforward, utilizing a combination of aerial herbicidal spraying (e.g., 53.8 percent glyphosate) and controlled burning. Ideally, the common reed is sprayed with herbicide at the end of the growing season in October when the plant is drawing nutrients to its ribosomal root system (effective for maximum kill). The dead biomass is then burned off in the December-February time frame. Finally, the reed is sprayed again at the end of the next growing season. APG uses in-house resources for aerial spraying and prescribed.

Purple loosestrife (*Lythrum salicaria*) is another invasive plant species that is associated with wetlands. This species has been documented sporadically on APG. There is currently no active monitoring for this species at APG.

4.2.2 Management Strategies and Actions

Strategy: Manage vegetation and fuel loads on ranges to sustain firing boxes, impact areas, and lines of sight (to include camera, targetry, etc.) for military weapons systems testing and training

- Action: Implement Sustainable Range Vegetation Management component plan with desired current and future vegetation conditions for ranges and potential methods of implementation (mowing, chemical spraying, tree cutting, prescribed burning)

Strategy: Maintain resources (labor and funding) and ecosystem services for grass fields, riparian buffers, and shorelines

- Action: Coordinate with DPW Roads and Grounds to develop reduced mowing schedule for grass fields, selecting some fields for agricultural outleasing and wildlife habitat

- Action: Coordinate with electrical privatization contractor (City Light and Power) to develop reduced mowing schedule for power line rights of way, to minimize potential impacts to grassland birds and other wildlife

- Action: Develop guidance document for riparian buffers and shorelines to assist DPW Roads and Grounds with vegetation maintenance to balance ecosystem protection with aesthetic viewsheds; review and update guidance annually or as needed

- Action: Provide public awareness brochure to on-site workers and residents regarding riparian buffer and shoreline sustainment

Strategy: Reduce spread of invasive species

- Action: Continue to control common reed dominated wetlands through spraying and/or burning where the likelihood of success is greatest

- Action: Provide public awareness brochure to on-site workers regarding purple loosestrife, to encourage reporting of sightings of this species and to supplement monitoring efforts

- Action: Continue eradication of forest floor invasive species, such as autumn olive *(Elaeagnus umbellata),* multiflora rose *(Rosa multiflora),* Japanese stilt grass *(Microstegium vimineum)*, through implementation of the Forest Management component plan of the INRMP

Strategy: Improve sustainable landscaping of cantonment areas

- Action: Incorporate BayScaping practices into landscape projects with emphasis on native only plant species and minimal herbicidal use

- Action: Incorporate pollinator gardens into landscape projects with emphasis on native only plant species that benefit pollinators (e.g., butterflies, moths, bees, bats, birds)

4.3 WETLANDS AND FLOODPLAIN MANAGEMENT

4.3.1 Background

The wetlands management program manages wetlands and streams primarily through the requirements of Sections 401 (water quality) and 404 (filling and other impacts) of the Clean Water Act, and the MDE Code of Maryland Regulations (Title 26). The wetlands management program analyzes projects and other activities to minimize impacts to wetlands, wetlands buffer, and floodplain and streams; obtains appropriate state and federal permits; monitors construction activities; and develops and monitors mitigation efforts. Coordination with the USACE Baltimore District and the MDE's Wetlands and Waterways is extensive.

The main focus of wetlands management is "no net loss" as federally mandated by EO 11990. APG's wetlands contribute significantly to improving water quality in the upper Chesapeake Bay, and wetland habitat is a significant contributor to the biodiversity present on the installation.

Regulation of wetlands protection is the responsibility of the USEPA, USACE, and the MDE. Much of the effort of the APG wetlands program is guiding mission and development proponents through the process of obtaining wetlands permits to allow them to impact wetlands to perform their mission. The process can be complicated and time-consuming depending on the complexity of the project, its impacts on wetlands, and required mitigation.

The USACE Baltimore District uses two types of Regional General Permits: State Programmatic General Permits and Nationwide Permits that are reserved for only the most minor impacts to waters of the U.S. regulated by the USACE. Maryland operates under a State Programmatic General Permit, in lieu of Nationwide Permits. The Maryland State Programmatic General Permit expedites the USACE's review of certain activities that are subject to federal jurisdiction, but does not preclude permit applications required under state regulations.

Most Nationwide Permits have been suspended in Maryland since there is a State Programmatic General Permit already in place. Individual Permits are generally reserved for projects with potential for substantial environmental impacts. An Individual Permit requires a full public interest review, including public notices and coordination with involved agencies, interested parties and the general public.

Maryland has adopted wetland protection laws that include mitigation requirements. These mitigation provisions typically establish a "no net loss" goal, include ratio requirements and site/kind preferences, and language on banking and in-lieu-fee options. Maryland has adopted mitigation regulations in addition to requirements under Section 404 of the federal Clean Water Act program.

During project development, proponents are encouraged to site the project footprint to avoid or at least minimize impacts to wetlands. If wetland impacts are unavoidable,

then impacts must be mitigated. Mitigation is costly and wetland mitigation sites must be managed long-term; therefore, considerable planning is required to select a mitigation site that provides the most ecosystem benefits and minimizes impacts to existing and future military missions. Post-construction monitoring for a period of five years of wetland mitigation sites is required under permit conditions. The sites are required to meet the mitigation performance standards as outlined in each permit.

APG has a shoreline stabilization permit that was issued through the USACE Baltimore District in 2008. This permit has been used for several installation shoreline stabilization projects to protect mission sustainment. The permit will expire in 2018.

APG continues to be contacted by the USACE on the possibility of using APG as a placement site for clean dredged materials generated by maintenance dredging of the Chesapeake Bay and C&D Canal shipping channels. Dredging these channels produces an abundance of dredged materials (millions of cubic yards) which may be utilized in a beneficial manner by creating wetlands behind hardened structured. Thorough evaluations of any dredged materials and proposed placement sites would be needed to ensure that resulting placement would be environmentally sound and not restrict or impede military mission.

In accordance with EO 11988, APG avoids direct and indirect development of floodplains, and restores and preserves natural and beneficial values served by floodplains, in the implementation of land management, construction, and land use actions. The 100-year floodplain, which has a 1 percent chance of being exceeded in any one year, is normally used for assessing the potential impact of human activities in the floodplain. When a critical action is involved, defined as an action for which even a slight chance of flooding has a great impact, the floodplain to be used for impact assessment is the 500-year floodplain (Title 44 CFR Part 9). Critical actions include those that produce, use, or store highly volatile, flammable, explosive, or toxic materials. Floodplain management regulations require such project facilities to be located outside the applicable floodplain to minimize floodplain impacts. Potential impacts to floodplains and mitigation measures for proposed actions are identified as early as possible in the NEPA process and are addressed at the same time as wetland impacts.

4.3.2 Management Strategies and Actions

Strategy: Manage for "no net loss of wetlands"

- Action: Apply for new programmatic 10-year shoreline stabilization permit to support mission sustainment
- Action: Employ off-site mitigation banks for wetlands mitigation
- Action: Develop long-term monitoring schedules for on-site mitigation sites
- Action: Continue to investigate use of installation property for beneficial use area for dredged materials

4.4 SOIL MANAGEMENT

Soil is a valuable resource. APG's goal is to keep all soil from excavation projects on the installation. Various projects need soil such as landfill covers, building demolition sites to fill in depressions, testing/training areas, and berms to provide security, safety, and aesthetics. Advance planning is the key to minimizing the generation of excess soil and maximizing on-site use. The project design and construction contracting process can include standard specifications that increase on-site utilization, such as raising the elevation by six inches on the entire site. Another design option is utilization of LID techniques that require less excavation.

Stockpiles are a good use of excess soil. Creating a stockpile site requires appropriate environmental compliance documentation to include site approval, plans, permits, and compliance actions typical of new construction and facility management. Developing a new stockpile can take from four to six months or longer depending on the number of acres. Selecting a location requires avoidance of critical areas, wetlands, floodplains, other sensitive areas, and review of Master Plan Land Use prior to presenting the site to the APG Site Selection Board for approval. Currently, APG's soil stockpile volumes exceed soil needs, and the occurrence of unpermitted stockpiles sites has increased. There are on-going discussions within APG DPW for options to beneficially re-use soil.

The requirements for requesting soil stockpile sites include project, proponent, location of generated soil, available hauling date, and estimated quantity of soil generated. Soil sampling and analysis are needed if the generating site has a Land Use Control, a past history of contamination, abnormal soil discoloration or odor (oil saturation), or if the soil is being transferred to a permitted site that requires sampling (open burn/open detonation sites or landfill cover site).

Soil from the Edgewood Area of APG cannot leave the Edgewood Area due to the potential for chemical agent contamination from historic mission operations. Soil from the Aberdeen Area of APG can leave the installation. However, off-post transport is discouraged due to the loss of a natural resource and potential liability to APG. The requirements for taking soil off-post include soil sampling and analysis and identifying a land reclamation or landfill site that provides a "No Re-Use" statement. Due to the presence of the corn cyst nematode, portions of four counties in Maryland (including southern Harford County and all of APG) are in a quarantine area. For soil to leave the quarantine area, the soil must be tested and approved by the Maryland Department of Agriculture.

Soil management also addresses erosion and sediment control practices. All ground disturbance activities must ensure that exposed soil is properly stabilized to prevent soil run-off during storm events. An MDE-approved Erosion and Sediment Control Plan is required for projects that involve clearing and grading that disturbs 5,000 square feet or more of land area, or disturbs 100 cubic yards or more of earth.

APG's DPW Environmental Compliance Branch is responsible for the soil management program and APG's Soil Management Plan. The Soil Management Plan is available for

review in the office of the DPW Environmental Compliance Branch Chief. Current challenges for soil management include: 1) updating the 2011 APG Soil Management Plan, 2) implementing procedures for ensuring that there are no un-permitted stockpile sites, 3) working with DPW Master Planning Division to identify areas to make soil stockpile sites available for ongoing construction and tenant use, and 4) implementing procedures for beneficial re-use of excess soil.

4.5 CHESAPEAKE BAY MANAGEMENT

4.5.1 Background

Every action taken on APG aimed at protecting or enhancing habitat, protecting species, or improving water quality supports the restoration of the Chesapeake Bay and both the Army Chesapeake Bay Strategy and the EO 13508. The ecology of the Chesapeake Bay is intimately interdependent. Only with a collaborative effort amongst programs and program management can we hope to measure our successes in contributing to the restoration of the Chesapeake Bay. While strategies and actions in other program areas in this INRMP support the restoration of the Chesapeake Bay, there are a few that are not captured elsewhere and are presented below.

4.5.1.1 Stormwater

Managing stormwater run-off contributes towards reducing nutrient and sediment loads into the Chesapeake Bay, which is the goal of the Chesapeake Bay TMDL. APG currently manages non-point source stormwater run-off from the installation through established stormwater BMPs. Since 2000, BMPs have been installed during new construction projects that meet the current MDE stormwater quality and quantity treatment criteria. BMPs installed before 2000 were designed to meet water quantity objectives, but not necessarily water quality objectives. APG's current Municipal Separate Storm Sewer Systems-MS4 permit requires that BMPs be properly constructed and maintained in accordance with the 2015 Maryland Stormwater Management and Erosion and Sediment Control Guidelines for State and Federal Projects. APG is requesting multi-year funding to address stormwater BMPs (new and retrofits). APG has approximately 500 BMPs to include sand filters, bioretention ponds, micro-bioretention ponds, rain gardens, submerged gravel wetlands, bioswales, grass swales, dry extended detention ponds, and wet ponds. A complete listing of BMPs is maintained by the DPW Environmental Division, Compliance Branch.

A new MS4 permit for APG is expected to be issued by the end of December 2016. The permit will have a new requirement to treat stormwater from 20 percent of APG's impervious surface that has little or no stormwater treatment over the 5-year period of the permit.

4.5.1.2 Low Impact Development

Low Impact Development (LID) is a management approach for construction sites that use special landscaping techniques, alternative permeable surfaces, and small-scale green technologies that slow, filter, and adsorb stormwater. The overarching objective is to keep a construction site as close to pre-development conditions as possible, thus reducing the run-off from impervious surfaces that typically picks up sediment, nitrogen, and phosphorus that discharge directly into the Chesapeake Bay. In accordance with APG's LID policy, for every development project, LID practices need to be fully considered early in the planning and design stages and incorporated into the design review process. APG has incorporated LID technologies into several recent projects (Table 4-1).

Table 4-1. Installation Development Projects Incorporating Low Impact Development Technologies

Project	LID Technology
• 400-Meter Running Track (Fanshaw Parade Field)	⇨ Bioswales
• LOC B Bridge (Airbase 5)	⇨ Bioswales
• RV Campground (Shore Park)	⇨ Submerged Gravel Wetland, Micro-Bioretention Facilities
• JLENS (Graces Quarters)	⇨ Submerged Gravel Wetlands
• WWTP Enhanced Nutrient Reduction Upgrade (Edgewood Area)	⇨ Submerged Gravel Wetlands, Micro-Bioretention Facilities

4.5.1.3 Shoreline Protection

Prevention of shoreline erosion reduces excess nutrient contamination and siltation of the Chesapeake Bay, and provides better habitat for its living resources. While shoreline erosion is a natural process, it also threatens valuable facilities necessary to maintain a military mission at APG. To prevent facility loss and protect and enhance Chesapeake Bay habitat, APG stabilized some sections of shoreline most prone to seasonal storm surges and wave erosion. Stabilization efforts used combinations of hard structures (stone rip-rap, off-shore stone breakwaters) and soft or natural structures (gentle slopes, native vegetation). A significant amount of shoreline is still susceptible to erosion. Therefore, continued efforts to stabilize additional sections of shoreline are necessary to ensure mission sustainment.

4.5.1.4 Submerged Aquatic Vegetation Restoration

The importance of submerged aquatic vegetation (SAV) is well known as a primary indicator of local water quality, nursery areas for fish and crustaceans, filters of nutrients and sediment, and natural stabilization for shorelines. As part of cooperative partnerships with a variety of federal, state, and local agencies, APG has monitored SAV distribution, diversity and habitat since 1997. The VIMS conducts annual aerial surveys to photograph and map SAV in the Chesapeake Bay. An APG Natural Resources project manager coordinates the overflight of the installation's waters and retains possession of the photographic film through the installation security process. APG also supports these efforts with ground surveys used in conjunction with the photographic interpretation. Water quality, habitat requirements and planting methods have been and need to be continually studied in an effort to develop and maintain a restoration program. Coverage of SAV can fluctuate greatly from year to year with changes in environmental conditions. These fluctuations also make on-the-ground monitoring necessary to record the presence and health of restored beds as well as the presence, health and species make-up of natural beds. While some SAV planting efforts have been successful at APG at restoring vegetative beds, finding additional suitable and cost-effective locations is difficult due to UXO potential. As with all habitat

restoration, SAV restoration efforts must also consider military mission to ensure no net loss of testing and training lands and waters.

4.5.1.5 Benthic Monitoring

Long-term benthic (LTB) monitoring has been part of Maryland's Water Quality Monitoring Program for the Chesapeake Bay since 1984. The monitoring program is supported and funded by a partnership between the Maryland Department of Natural Resources and the USEPA Chesapeake Bay Program, and is facilitated by Versar, Inc. Data from the LTB monitoring program contributes to the water quality characterization and list of impaired waters under the Clean Water Act, and to the development of the Chesapeake Bay TMDL. The Chesapeake Bay LTB Monitoring Program component measures water quality, sediment quality, and the abundance and richness of benthic invertebrates. The LTB study uses two types of sample sites: 1) fixed sites to identify temporal trends and 2) spatially random sites to assess bay-wide benthic community status. Currently, fixed and random sites are sampled once a year in late August or September, with random sites sampled at a new set of locations every year.

APG has exclusive jurisdiction over large portions of the tidal Gunpowder River, tidal Bush River, Chesapeake Bay, and several smaller tidal tributaries. Therefore, sampling crews from outside agencies must coordinate with APG for access into installation waters. The DPW Natural Resources' role in the LTB monitoring study is to schedule site access for sampling crews with installation range control. Historically, sample locations for the LTB study included 14 locations in the Gunpowder River, Bush River, and Chesapeake Bay. The number of sites within APG waters has decreased over the years as the program's sampling design has changed.

4.5.2 Management Strategies and Actions

Strategy: Reduce nutrient and sediment loads into the Chesapeake Bay

- Action: Develop, design, and construct new stormwater BMPs in areas with little or no stormwater treatment and retrofit existing stormwater BMPs to meet water quality standards

Strategy: Ensure stormwater BMPs are constructed and operating as designed

- Action: Develop stormwater BMP inspection/maintenance plan

Strategy: Protect the Chesapeake Bay's coastal resources

- Action: Identify, prioritize, and implement shoreline stabilization measures on additional sections of shoreline that are prone to erosion to ensure mission sustainment

- Action: Continue partnerships in SAV monitoring/restoration

- Action: Continue partnerships in benthic monitoring

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4.6 WILDLAND FIRE MANAGEMENT

4.6.1 Background

The purpose of wildland fire management is to ensure sustainment of mission infrastructure with fire control efforts that incorporate natural resources considerations to the extent practicable. Testing on APG includes various evaluations of weapon systems, ammunitions, and other explosive materials that can ignite fires on the range. Given the nature of the mission at APG and the installation's desire to maintain good relations with its neighbors, fire suppression is the primary function of fire management. This minimizes public complaints and maximizes use of the range facilities.

The APG Fire Chief is the designated APG Wildland Fire Program Manager. The DPW Natural Resources staff coordinated with the DoO on the development of an Integrated Wildland Fire Management Plan (Appendix K). This plan details the procedures and actions for responding to wildfires and for preventing or minimizing uncontrolled wildfires.

4.6.1.1 Fire Suppression

The primary means of suppressing a range fire is through aerial drops of water. An in-house helicopter is equipped with a 700-gallon bucket (Bambi bucket) that can be lowered into a water body to fill the bucket, then flown to the fire and released from the air. An ATC helicopter out of PAAF is the first responder, and a National Guard helicopter out of WAH is available for back-up if needed. To diminish the likelihood of extensive fires, ATC and the DoO reached an agreement granting the Fire Department the authority to stop testing when the threat of fire is too high (during the dry periods of summer and autumn) and a helicopter is not available for firefighting purposes.

Because of the enormous cost associated with halting range operations due to fire threat, the Fire Department and ATC cooperated to determine what rounds create a high risk of fire. It was determined that tracers and high explosive rounds create a higher risk than other types of rounds. Consequently, ATC provides the Fire Department with information on where and when tracers or high explosives are used. The Fire Department limits its prescriptions for no firing scenarios to tests involving these rounds. When a fire is reported, the Fire Department works with the tester to extinguish the fire as quickly as possible so that testing can continue.

APG supports a large diverse population of wildlife and plants throughout the restricted areas and undeveloped grounds. Individuals within these species populations may be potentially impacted by wildland fires, through temporary displacement and loss of habitat, or permanently through loss of individuals. While APG supports numerous state listed plant species and federally protected birds (particularly bald eagles), APG's management of natural resources is focused on broad ecosystem level strategies. Therefore, accidental wildfires will typically not be contained or extinguished for the sole purpose of protecting a single species (as long as maintaining compliance with the Endangered Species Act).

The frequency and intensity of wildland fires can be reduced through management of fire breaks and fuel loads. However, fire prevention must also consider the beneficial impacts of fires in suppressing common reed (*Phragmites australis*), releasing native seed banks, and suppressing early successional sweet gum. An attempt will be made to strike a balance among these requirements, while foremost ensuring the sustainment of the military mission.

4.6.1.2 Prescribed Burns

In 2016, APG re-instituted a prescribed burn program to reduce the frequency and intensity of wildland fires, maintain lines of sight at ranges, and reduce the spread of common reed in specific range areas. The locations of ranges and fire occurrences were evaluated to identify areas where prescribed burning might help prevent fires, or reduce the severity of those that occur, by reducing fuel loads. The following range areas are identified for on-going prescribed burn efforts:

- Abbey Field (91 acres)
- Henry Field (700 acres)
- High Velocity / Barricade C (50 acres)
- Main Front / Trench Warfare (800 acres)
- Michaelsville / Light Rifle (90 acres)
- Mulberry Point (128 acres)
- New Bombing Field (200 acres)
- Perryman (61 acres)
- Recoilless Range B / AA3 (370 acres)
- Romney Creek (75 acres)
- 7600 Field East to Bay (2,660 acres)

Prescribed burns are most effective during the late winter timeframe (January-February) when fuel loads are driest. However, range scheduling, weather, and other variables can delay scheduled burns until March or early April. Optimum weather conditions are light winds (less than 10 mph) from the southwest, west, or northwest, and clear forecast with little to no precipitation previous day. Fires are initiated via aerial ignition (Dragon Balls) or ground ignition (drip torches). Ground crews closely monitor the fire for the duration of the burn. Additional monitoring and fire suppression is provided by helicopter and bambi bucket. All flames are extinguished and smoke generation minimized by sunset.

Prescribed burns are coordinated through APG's natural resources managers to ensure that fires do not cause ecological damage beyond the benefit of the prescribed burns. Pre- and post-burn monitoring for fauna and flora impacts and effectiveness of burn is conducted by the Natural Resources Branch.

All prescribed burns are fully coordinated with Garrison Command Office and Public Affairs Office, with a 48-hour notification prior to burning.

4.6.2 Management Strategies and Actions

Strategy: Implement wildland fire management

- Action: Continue to implement prescribed burns at select range areas and conduct pre- and post-burn monitoring of effectiveness
- Action: Survey natural fuel loads and implement fuel load reduction efforts where needed
- Action: Maintain firebreaks as effective control measures for prescribed burns; create additional firebreak on Trench Warfare range

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4.7 PEST MANAGEMENT

The purpose of pest management at APG is to use integrated approaches of chemical and non-chemical control techniques with minimal environmental contamination. Integrated pest management reduces reliance on pesticides and enhances environmental protection. Chemical control is almost always a temporary and more expensive measure, because applications must be repeated. Non-chemical control, may initially be more expensive than chemicals, but will usually be more cost effective in the long term. Non-chemical controls also have the added advantage of being non-toxic, thereby reducing the potential risk to human health and the environment. APG has an Integrated Pest Management Plan that is available for review in the office of the Integrated Pest Management Coordinator (DPW – Operations and Maintenance Division). Adherence to the plan ensures effective, economical, and environmentally acceptable pest management and maintains regulatory compliance.

APG's integrated pest management is based on four types of control measures:

- **Mechanical and Physical Control**

  These types of controls alter the environment in which a pest lives, traps and removes pests where they are not wanted, or excludes pests. Examples of this type of control include harborage elimination through caulking or filling voids, screening, mechanical traps or glue boards, and nets and other barriers to prevent entry into buildings.

- **Cultural Control**

  Strategies in this method involve manipulating environmental conditions to suppress or eliminate pests (e.g., cleaning food service areas and replacing damaged door seals). Elimination of food and water for pests through good sanitary practices can prevent pest populations from becoming established or from increasing beyond a certain size.

- **Biological Control**

  In this control strategy, predators, parasites or disease organisms are used to control pest's populations. Sterile flies may be released to lower reproductivity. Viruses and bacteria may be used which control growth or otherwise kill insects. Parasitic wasps may be introduced to kill eggs, larvae or other life stages. Biological control may be effective in and of itself, but is often used in conjunction with other types of control.

- **Chemical Control**

  Pesticides kill living organisms, whether they are plants or animals. At one time, chemicals were considered to be the most effective control available, but pest resistance rendered many pesticides ineffective. In recent years, the trend has been to use pesticides which have limited residual action. While this has reduced human exposure and lessened environmental impact, the cost of chemical control has risen due to requirements for more frequent application.

Because personal protection and special handling and storage requirements are necessary with the use of chemicals, the overall cost of using chemicals as a sole means of control can be costly when compared with non-chemical control methods.

The Integrated Pest Management Coordinator assists the DPW Natural Resources staff with coordination of aerial spraying for common reed (*Phragmites australis*) and sweetgum (*Liquidambar styraciflua*). In addition, the Integrated Pest Management Coordinator assists the DPW Natural Resources staff and the DoO Conservation Law Enforcement Branch with trapping and removal of live wild animals (raccoons, skunks, etc.) from buildings.

4.8 THREATENED AND ENDANGERED SPECIES MANAGEMENT

4.8.1 Background

The Endangered Species Act (16 USC 35), enacted in 1973, states that "…the policy of Congress [is] that all federal departments and agencies shall seek to conserve endangered species and threatened species." Army policy regarding endangered species acknowledges the Endangered Species Act in AR 200-1: "Carry out mission requirements in compliance with 16 USC 35. Integrate endangered species management and installation planning functions to ensure compliance with 16 USC 35."

Critical habitat can be designated by the USFWS (or NOAA Fisheries) if warranted for the protection of a listed species. Critical habitat is defined as an area deemed essential to the conservation of a threatened or endangered species, and which may require special management consideration of protection. Pursuant to Section 4(a)(3)(B)(i) of the Endangered Species Act, the Secretaries of the Departments of Interior and Commerce are prohibited from designating as critical habitat any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an INRMP prepared in accordance with the Sikes Act. The USFWS uses three criteria to determine if an INRMP provides adequate special management or protection to obviate the need for critical habitat designation:

- The INRMP provides a conservation benefit to the listed species. The cumulative benefits of the management activities identified in the INRMP for its duration maintains or provides for an increase in a species' population or the enhancement or restoration of its habitat within the area included in the INRMP (i.e., those areas essential to the conservation of the species). A conservation benefit may result from reducing habitat fragmentation, maintaining or increasing populations, insuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies.

- The INRMP provides certainty that relevant agreed-on actions will be implemented. Persons implementing the INRMP can accomplish its goals and objectives, have adequate funding to implement agreed upon activities, have implementation authority, and have obtained all the necessary authorizations or approvals. The INRMP includes an implementation schedule, including completion dates, for the conservation effort.

- The INRMP provides certainty that the conservation effort will be effective. USFWS considers these criteria when determining the effectiveness of the conservation effort:

  (a) Biological goals, which are broad guiding principles for the program, and objectives, which are measurable targets for achieving the goals

  (b) Quantifiable, scientifically valid parameters that demonstrate achieving objectives and standards measuring progress

(c) Provisions for monitoring and, where appropriate, adaptive management

(d) Provisions for reporting progress on implementation based on compliance with the implementation schedule and effectiveness based on evaluation of quantifiable parameters of the conservation effort

(e) A period of time sufficient to implement the actions and achieve the benefits of its goals and objectives

The purpose of APG's threatened and endangered species management is to confirm the absence/presence of populations of threatened, endangered, and potentially listed species on the installation, and to develop conservation programs for those species. A successful conservation program meets the USFWS criteria for avoiding designations of critical habitat, and provides benefits to declining species to avoid potential listing. The INRMP should provide similar conservation measures for state-listed species as are provided to federally-listed species, as long as such measures are not in direct conflict with the military mission. If conflicts do occur, APG consults with the MDDNR to determine if any conservation measures can be feasibly implemented to mitigate impacts.

New surveys are needed to determine the presence/absence of federally-listed and state-listed threatened and endangered species on APG. The geographic ranges of several listed fauna species overlap with APG, and suitable habitat may exist on the installation. Previous surveys focused on specific project areas or are out-of-date (over 14 years old). Fragmentation and loss of habitat surrounding APG may leave the undeveloped areas of the installation as one of the last refuges for some species.

Past surveys for listed plant species on APG are very outdated, and should be conducted again. The USFWS conducted a survey in 1998 and 1999 to determine the status and distribution of any rare, threatened, or endangered plant species at APG. No federally-listed species were discovered during the study, but 62 state-listed vascular plant species were found.

4.8.1.1 Listed Species

There are six federally-listed animal species that are known to inhabit (or historically inhabit) APG, or inhabit areas contiguous to APG. In addition, there is one species (short-eared owl) that is only state-listed. These species are detailed below.

- **Atlantic Sturgeon (Chesapeake Bay Distinct Population Segment)**

  Federal Listing: Endangered
  State Listing: Endangered
  Location: On-site

  In 2012, four distinct population segments of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) were listed as federally endangered: New York Bight, Chesapeake Bay, Carolina, and South Atlantic. The species is also state listed as endangered. The Atlantic sturgeon is an anadromous species, spending most of its life in the estuarine and marine coastal environment. In the mid-Atlantic region, spawning adults ascend the freshwater tributaries of estuaries to spawn from April to May.

Atlantic sturgeon

  APG is developing sturgeon management strategies with informal consultation through the NOAA Fisheries Services. This section will be updated at completion of the informal consultation.

- **Shortnose Sturgeon**

  Federal Listing: Endangered
  State Listing: Endangered
  Location: On-site

  The shortnose sturgeon (*Acipenser brevirostrum*) was listed as federally endangered in 1967, and is also state listed as endangered. Like the Atlantic sturgeon, the shortnose sturgeon is anadromous, returning to freshwater to spawn.

Shortnose sturgeon

  APG is developing sturgeon management strategies with informal consultation through the NOAA Fisheries Services. This section will be updated at completion of the informal consultation.

- **Eastern Black Rail**

  Federal Listing: Threatened
  State Listing: Endangered
  Location: On-site

  The eastern black rail (*Laterallus jamaicensis jamaicensis*) is one of four black rail subspecies. It is a small, secretive marsh bird that lives predominantly in salt and freshwater marshes, but can also be found in upland marsh areas. The species was last documented (by call) on APG in 2002 in the marsh adjacent to Aviation Arms Road, with earlier calls noted in Boone Creek, H-Field, and Carroll Island marshes. The species was federally listed as threatened in 2020, and is also state listed as threatened.

  Eastern black rail
  (Photo by USFWS)

  The USFWS established prohibitions, and exceptions to prohibitions, for the conservation of the Eastern Black Rail under Section 4(d) of the Endangered Species Act. The primary goals of this 4(d) rule are to minimize incidental take of Eastern Black Rails and ensure that the dense overhead vegetated cover needed by the species is maintained. Prohibited habitat alteration activities that are relevant to APG operations are: prescribed burning and mowing during the rail's nesting period; and long-term damage, fragmentation, or conversion of rail habitat and contiguous wetland-upland transition zone habitat. The exceptions to these prohibitions include incidental take resulting from:

  - Mowing or other mechanical vegetation maintenance in persistent emergent wetlands during the rail's nesting period for the maintenance of existing infrastructure (e.g., fire breaks, roads, rights-of-way, fence lines, airfields, culverts)
  - Mowing or other mechanical vegetation maintenance in persistent emergent wetlands during the rail's nesting period for the restoration of rail habitat (control of woody encroachment and invasive plants)
  - Actions taken to control wildfires
  - Establishment of new fire breaks and new fence lines

  In accordance with the 4(d) rule, APG does not conduct prescribed burns 1 May-31 August in order to avoid potential impacts to Eastern Black Rails. Other vegetation maintenance activities that may impact rail habitat are also scheduled for outside the nesting season to avoid impacting nests whenever possible. This section will be updated as other conservation measures or management actions are developed.

- **Short-eared Owl**

  Federal Listing: None
  State Listing: Endangered
  Location: On-site (transient during migration)

  The short-eared owl (*Asio flammeus*) is state listed as endangered. This owl lives in fresh and saltwater marshes, bogs, prairies and grasslands, and open woodlands. This species is only seen at APG during fall migration. MDDNR considers only the breeding population as state-endangered. Therefore, APG does not maintain a management program specifically for this species. However, APG provides valuable wintering habitat, and vegetation management techniques, such as prescribed burning and mowing that limit encroachment of woody species and maintain open grasslands for mission activities, also benefit these owls.

Short-eared owl

- **Northern Long-eared Bat**

  Federal Listing: Threatened
  State Listing: Threatened
  Location: Contiguous

  The northern long-eared bat (*Myotis septentrionalis*) was listed as federally threatened in 2015. The species is also state listed as threatened. There is no critical habitat designated for the species, as the USFWS determined that such designation is not prudent. This species has an extensive range that includes the mid-Atlantic U.S.

Northern long-eared bat (Photo by Al Hicks, New York State Department of Environmental Conservation)

  These bats tend to hibernate in caves and mines ("hibernacula"); therefore, there is no winter habitat at APG (unless the species is inhabiting abandoned bunkers). In spring, reproductive females migrate to roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees. Over 35 different tree species, typically ≥3 inches diameter at breast height, have been documented as summer roosting habitat (USAEC 2015). The active season for the bat in Maryland is considered April-October, with pup rearing season of June-July.

Bat surveys were conducted on APG in 2011 and 2017 using acoustical monitoring equipment. The northern long-eared bat was not detected during either survey. Follow-up acoustical surveys, and visual examination of abandoned bunkers, are needed to confirm the continued absence of this species on APG. Until the absence of the species can be confirmed, APG operates in accordance with IMCOM's programmatic consultation (USAEC 2015, Appendix L).

- **Rusty-Patched Bumble Bee**

  Federal Listing: Endangered
  State Listing: Endangered
  Location: Contiguous (historic, likely now gone)

  The rusty-patched bumble bee (*Bombus affinis*) was listed as federally endangered in 2017, and state endangered in 2021. This is the first bee species in the continental U.S. to be declared endangered by the USFWS. There is no critical habitat designated for the species, as the USFWS determined that such designation is not prudent. There are no known occurrences of the bee on APG; however, APG has suitable habitat and is within the historical range of the species. The rusty-patched bumble bee lives in underground colonies. The bee lives for only one year, except the queen who is dormant during the winter and emerges in the spring to begin a new colony with eggs fertilized during the prior fall.

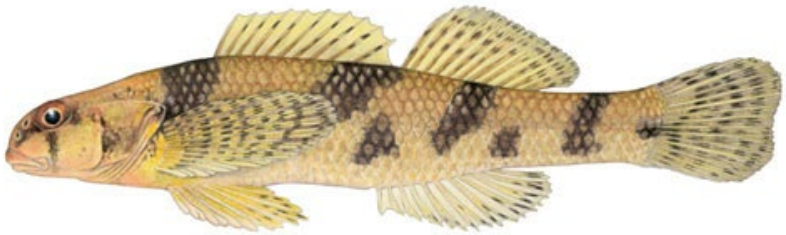
  Rusty-patched bumble bee (Photo by Dan Mullen)

  Although no specific management actions are stated for this species, APG follows best management practices to provide conservation benefits to pollinator species in general. Conservation efforts focus on habitat restoration and educating the community and workforce on avoiding the use of pesticides containing neonicotinids. Neonicotinids have demonstrated impacts to the rusty-patched bumble bee and other pollinator species.

- **Maryland Darter**

  Federal Listing: Endangered
  State Listing: Endangered
  Location: Contiguous (historic, likely now gone)

  The Maryland Darter (*Etheostoma sellare*) was listed as federally endangered in 1967. This fish is also state listed as endangered. The Maryland Darter is an endemic small freshwater fish that historically occupied portions of Deer Creek, Swan Creek, and Gashey's Run. There have been no sightings of the species on APG. The species grows to just under 3 inches in length and has a relatively short life span of about 3 years. Historically, the Maryland Darter was found in well-oxygenated, rocky or gravelly riffles.



Maryland darter
(image by David Neely, MDDNR)

Although no specific management actions are stated for this species, APG implements management strategies for the protection of streams and riparian buffers, which in turn can provide conservation benefits to the Maryland Darter. These strategies include protection and enhancement of riparian buffers, and minimization of stormwater run-off through best management practices.

4.8.1.2 Species That Are Petitioned, Under Review, Candidate, or Proposed for Listing

The USFWS has developed a National Listing Workplan that strives to focus their limited resources on the species most in need of protection under the Endangered Species Act. For each petitioned or reviewed species, a timeline is proposed to allow the USFWS to carry out listing activities (petition findings, listing determinations, critical habitat designations) in a timely and cost-effective manner. The National Listing Workplan is based, in part, on the USFWS's prioritization methodology for 12-month findings. Findings are prioritized from 1 (highest priority) to 5 (lowest priority):

1 – Critically Imperiled
2 – Strong Data Available on Species' Status
3 – New Science Underway
4 – Conservation Efforts in Development or Underway
5 – Limited Data Currently Available

There are eight animal species under review by the USFWS that are known to inhabit (or historically inhabit) APG, or inhabit areas contiguous to APG. These species are detailed below. Development of management strategies for these species should not wait until the species are listed. Actions can be implemented now to survey for and provide conservation benefit to the species and habitat. Should any of these species become listed, then APG will further refine management strategies and actions to protect these species.

- **Little Brown Bat**


Little brown bat

Federal Listing: Under Review
Priority Ranking: 4
State Listing: None
Location: On-site

The little brown bat (*Myotis lucifugus*) is under a discretionary status review, and the review finding is expected in FY22. The little brown bat was detected on APG during a 2011 acoustical survey, but not in a 2017 survey. Like the northern long-eared bat and tricolored bat, the little brown bat is considered a cave bat that hibernates in caves and mines. Like most bat species, the population of tricolored bats has significantly declined due to a fungal disease known as white-nose syndrome.

- **Tricolored Bat**


Tricolored bat

Federal Listing: Under Review
Priority Ranking: 2
State Listing: None
Location: On-site

The 12-month review finding for the tricolored bat (*Perimyotis subflavus*) is expected in FY22. The tricolored bat was detected on APG during 2011 and 2017 acoustical surveys. This bat is the smallest bat in Maryland and weighs a mere one fifth of an ounce. As its names implies, this bat has tri-colored fur (dark brown base, pale middle band, and dark tip). Like the northern long-eared bat, the little brown bat is considered a cave bat that hibernates in caves, rock crevices, and mines.

- **Northern Red-Bellied Cooter**


Northern red-bellied cooter
(Photo by John White)

Federal Listing: Under Review
Priority Ranking: 2
State Listing: None
Location: On-site

The 12-month review finding for the northern red-bellied cooter (*Pseudemys rubriventris*) is expected in FY23. The northern red-bellied cooter is common on APG. These turtles prefer ponds with soft silt bottom, abundant aquatic vegetation, and fallen logs for basking. These are some of the larger turtles on APG, averaging 10 to 12 inches long.

- **Spotted Turtle**

Spotted turtle
(Photo by Chris Peterson, U.S. Navy)

Federal Listing: Under Review
Priority Ranking: 4
State Listing: None
Location: On-site

The 12-month review finding for the spotted turtle (*Clemmys guttata*) is expected in FY23. Spotted turtles favor waters with a soft bottom and aquatic vegetation. They often bask along the water's edge, on brush piles in water, or on logs or vegetation clumps. Often, they move seasonally among different wetland types and may spend significant time on land during summer. Cold season hibernation occurs in the muddy bottoms of waterways or bogs in communal hibernacula. Spotted turtles are found in multiple locations on APG.

- **Monarch Butterfly**

Monarch butterfly

Federal Listing: Candidate
Priority Ranking: Listing Priority Number 8
State Listing: None
Location: On-site

The 12-month review finding for the monarch butterfly (*Danaus plexippus plexippus*) concluded that listing the monarch butterfly is warranted, but precluded by higher priority listing actions. The species remains a candidate species, and the USFWS will review the species status annually until a listing decision is made. The USFWS intends to propose listing in FY24. Monarch butterflies are not uncommon on APG, however, their numbers throughout their range have declined significantly due to habitat loss. Monarch butterflies rely exclusively on native milkweed as larval host plants and a critical food source. APG has three species of native milkweed (swamp milkweed, common milkweed, and butterfly milkweed) that support monarch butterflies. The decline of the monarch butterfly is representative of the general decline of pollinator species in the U.S.

A native pollinator garden was constructed as part of a restoration project for one of APG's military cemeteries. The garden was planted with three native species of milkweed, beebalm, blazing star, joe-pye weed and goldenrod to provide nectar sources and host plants for monarch butterflies and other pollinators. The garden was certified by Monarch Watch as a Monarch Waystation.

- **Wood Turtle**

Federal Listing: Under Review
Priority Ranking: 4
State Listing: None
Location: Contiguous

Wood turtle
(Photo by Linh Phu)

The 12-month review finding for the wood turtle (*Glyptemys insculpta*) is expected in FY23. Wood turtles are predominantly terrestrial, spending much of their time in forested areas or meadows adjacent to streams and creeks with clear water, and gravel or similar hard substrates. This turtle gets its name from the appearance of its carapace (top shell) which is rough, appearing like carved wood. The wood turtle is infrequently found in Harford County, and has not been sighted on APG.

- **Chesapeake Logperch**

Federal Listing: Under Review
Priority Ranking: 4
State Listing: Threatened
Location: Contiguous (historic, likely now gone)

Chesapeake logperch
(Photo by USFWS)

The 12-month review finding for the Chesapeake logperch (*Percina bimaculata*) is expected in FY23. This freshwater fish grows to 4 inches in length and prefers silt-free gravel substrates that allow the fish to flip over rocks with its nose in foraging for aquatic invertebrates. The species was historically found in the main stem and tributaries of the lower Susquehanna River, in several streams that drain into the upper Chesapeake Bay at the Susquehanna Flats, and in the Potomac River basin. The Chesapeake logperch is currently only found in the Susquehanna River basin. In 2018, the MDDNR sampled potential habitat in the riffle section of Winters Run below the lowhead dam, but found no Chesapeake logperch. Winters Run was surveyed by the USACE in 2020 and 2021, but again no Chesapeake logperch were found (Arcadis 2021). The USFWS has partnered with state and other agencies to identify and implement targeted conservation measures for the species, in the hopes of avoiding listing under the ESA. The fish is currently being propagated and reared in laboratories for releases into lower Susquehanna River tributaries.

4.8.2 Management Strategies and Actions

Strategy: Avoid critical habitat designations by employing conservation measures for current and potentially listed species

- Action: Deploy data receivers in APG waters to collect information on transmitter-deployed sturgeon that may travel through APG waters
- Action: Provide public awareness brochure to recreational anglers regarding sturgeon
- Action: Create and maintain pollinator gardens to benefit bees and other pollinator species
- Action: Conduct monitoring for monarch butterflies and milkweed which could contribute to a broader U.S. east coast monarch habitat suitability model
- Action: Create, maintain, and conserve monarch butterfly habitat through naturalized milkweed communities and constructed waystations
- Action: Conduct monitoring for spotted turtles to identify core habitat areas
- Action: Manage select wetland areas to remove invasive species (common reed, multiflora rose, red maple, etc.), encourage growth of native grasses and sedges, and maintain open sunny areas with fallen logs for basking and egg laying by turtles
- Action: Continue conservation efforts for SAV that will benefit turtles and other species
- Action: Follow recommendations for northern long-eared bat in IMCOM programmatic consultation for conservation of other bat species
- Action: Conduct surveys for eastern black rails to confirm presence/absence of species and potential habitat
- Action: Manage potential habitat for eastern black rails with time of year restrictions for vegetation maintenance (prescribed burning, spraying, and/or mechanical clearing) to protect nesting and molting rails (1 May-15 August)

Strategy: Determine presence/absence of threatened and endangered species and other species with potential for listing

- Action: Conduct acoustical surveys for northern long-eared bat and other bat species using USFWS-approved methodology

- Action: Conduct surveys for other threatened and endangered fauna species (federal and state listed) to determine presence/absence of species and to locate key habitats on installation

- Action: Conduct surveys for threatened and endangered flora species (federal and state listed)

4.9 FISH AND WILDLIFE MANAGEMENT

The management of fish and wildlife at APG has multiple purposes: 1) to maintain sustainable populations of game species; 2) to protect and manage the commercial and recreational fisheries to provide sustainable yields; 3) to promote the conservation of migratory birds; 4) to protect and manage the bald eagle population; 5) to minimize the impacts of nuisance animals; and 6) to promote and support ecological health and biodiversity on the installation. The fish and wildlife on APG are a State resource, and fall under the jurisdiction of MDDNR. Therefore, any action taken by APG in the management of fish and wildlife species is conducted in accordance with State laws and regulations. All species are considered important to ecological functioning and stability. Therefore, management actions should focus on overall ecosystem benefits rather than single-species promotion (while maintaining compliance with the Endangered Species Act and the Bald and Golden Eagle Protection Act). Greater biodiversity can result in greater system resilience, or the ability of a system to recover after disturbance. High biodiversity can moderate the effect of frequent, small-scale disturbances that result from the installation's mission.

4.9.1 Game Species

White-tailed deer and wild turkey are the predominant upland game species on APG. Other smaller game species include the eastern cottontail rabbit, gray squirrel, groundhog, mourning dove (*Zenaida macroura*), bobwhite quail (*Colinus virginianus*), and American woodcock (*Scolopax minor*). Numerous species of waterfowl are also hunted on APG. Currently, APG has no active population monitoring for these game species. Wildlife populations need to be monitored to ensure proper management. Monitoring may be undertaken for the purpose of determining whether management techniques are successful, whether positive or negative changes noted in habitats are due to changes in the populations of particular species, what the effects of particular aspects of the military mission on wildlife populations are or could be (if the mission should change), or whether changes to existing management practices or new management practices are necessary.

The deer hunting program is vital to control of the deer population at APG. Deer within the restricted areas are isolated from other areas by fencing. They can also be isolated from hunting pressure, because some areas are not hunted due to mission and/or UXO conflicts. This isolation can result in an overpopulation of deer and a narrowing of the gene pool, both of which are detrimental to the health of the herd. The deer herd at APG needs to be maintained at a healthy carrying capacity. The MDDNR recommends a target carrying capacity of 20 to 30 deer per square mile to sustain a healthy population. The current size of APG's deer herd has not been calculated, but past estimates ranged from approximately 2,000 to 4,000 individuals. Based on the MDDNR target, the population for APG should range from 1,250 to 1,875 deer. Managing the size of the installation's deer herd, especially in the cantonment area, will minimize the potential for collisions between deer and vehicles. Reducing the deer herd will also benefit the upland habitat. Heavy browsing by deer results in damage to tree and shrub plantings, including native flora, and loss of native bird and small mammal habitat. Any management action for the deer needs to also consider the impacts of the installation's

expanding coyote population. Coyotes are natural predators of white-tailed deer, particularly fawns. If coyotes are changing the established population dynamics of deer herds, then a combination of incentive coyote harvesting and adjusted deer harvest management strategies may be warranted to sustain healthy populations of deer and coyotes.

Recreational harvest continues to be the single most effective strategy for managing APG's deer population. An increase in doe harvest through special hunts may be necessary to reduce population density. In addition, allowing coyotes as a natural predator of deer to remain on the installation will contribute to managing the deer population. A monitoring program is needed to track the success of these population reduction efforts. One technique for estimating the deer population is utilizing a helicopter-mounted forward looking infrared (FLIR) system with videotape. This technique can provide a reasonable population census at a point in time, and also identify locations and densities of pockets of deer not subject to hunting pressure. Another technique is a spotlight count using high-power lights to illuminate deer along a prescribed nighttime driving route. Only open areas, such as fields, can be surveyed adequately using spotlight counts.

A significant challenge with the APG hunting program is UXO. Much of the optimal deer and other game habitat is located in restricted areas that are not open to hunting due to the presence of UXO. The range safety program requires yearly UXO sweeps of all potentially duded deer stand areas. This UXO sweep requirement has added to the expense of the hunting program.

4.9.2 Fisheries

APG's fisheries management focuses primarily on sustaining or improving water quality and habitat. These efforts are accomplished by following best management practices for controlling sediment run-off and erosion, limiting use of herbicides, and maintaining natural riparian areas.

Additionally, through the federal consistency process, anadromous fish spawning areas are protected from disturbance by avoiding construction, or other activities which may adversely affect these areas, from 1 March through 15 May (within critical area) or from 15 March through 15 June (non-tidal). This restriction protects several species of spawning fish in APG waters, including striped bass, yellow perch, white perch, shad, alewife, and blueback herring.

APG owns a fish ladder at the Van Bibber weir (low head dam) on Winters Run that was constructed to aid the migration of anadromous fish (shad and river herring) to their upstream spawning grounds. The 2020 and 2021 fish surveys conducted by the USACE on Winters Run concluded that the fish ladder is allowing for passage of migrating fish. American eel which is a migratory species was observed upstream and downstream of the weir.

4.9.3 Migratory Birds

Over 1,000 species of birds (migratory and residents) are federally protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter (or offer for sale, purchase, or barter), any migratory bird or the parts, nests, or eggs of such a bird, except under the terms of a valid USFWS permit. Under the Migratory Bird Treaty Act, "take" is defined as to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to hunt, shoot, wound, kill, trap, capture, or collect. The Migratory Bird Treaty Act allows for the humane removal of a migratory bird (other than a federally listed threatened or endangered species) from inside a building without a permit, if the bird poses a public health or safety threat, a threat to commercial interests, or a threat to itself. The USFWS is responsible for administering and enforcing the Migratory Bird Treaty Act.

The National Defense Authorization Act of FY03 (Pub. L 107-314, 116 Stat.2458, Dec 2, 2002, 16 USC 703 note) Section 315, amended the Migratory Bird Treaty Act to exempt the DoD for the take of migratory birds that result incidentally from authorized military readiness activities. Military readiness activities are defined as all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. This "Military Readiness Rule" is not a blanket exemption from the Migratory Bird Treaty Act for military readiness activities. Several provisions are included with the incidental take rule:

- For ongoing or proposed activities that may result in a significant adverse effect on a population of a migratory bird species (as assessed through the NEPA process), DoD agency must confer and cooperate with USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects.
- When conservation measures require monitoring, DoD agency must retain records of any monitoring data for five years.
- During INRMP reviews, DoD agency will report the migratory bird conservation measures implemented and the effectiveness of the measures in avoiding, minimizing, or mitigating take of migratory birds.

In accordance with EO 13186, the DoD and USFWS entered into a MOU (renewed in 2014) to promote the conservation of migratory bird populations; avoid or minimize take of migratory birds; and ensure non-readiness DoD operations are consistent with the Migratory Bird Treaty Act. This MOU specifically pertains to the following categories of DoD activities:

1. Natural resource management activities including, but not limited to, habitat management, erosion control, forestry activities, agricultural outleasing, conservation law enforcement, invasive weed management, and prescribed burning

2. Installation support functions, including but not limited to, administration, retail sales, food service, health care, water and sewage treatment, supply and storage, schools, housing, non-tactical equipment maintenance, base transportation, laundry and dry cleaning, recreation, and religious activities

3. Operation of industrial activities

4. Construction, maintenance, renovation, or demolition of facilities that support activities described in items 1 through 3

5. Hazardous waste cleanup

Under the Migratory Bird Treaty Act and the "Military Readiness Rule", DoD must monitor the effects of military readiness activities on migratory birds, develop and implement appropriate conservation measures for actions that may have a significant impact on a migratory bird population, and monitor the effectiveness of any required conservation measures. Under the MOU with the USFWS, DoD must ensure that its non-readiness operations are consistent with the Migratory Bird Treaty Act, must avoid or minimize the take of migratory birds, and must advance bird conservation through its natural resources management. To meet these requirements, the DoD Natural Resources Program developed a Strategic Plan for Bird Conservation and Management on DoD Lands (DoD 2014). Additionally, the DoD Partners in Flight (PIF) program provides guidance on addressing migratory birds in INRMPs. Based on the Strategic Plan and DoD PIF guidance, APG's migratory bird program consists of six components (permitting; inventory and monitoring; conservation measures; wildlife aircraft strike hazard abatement; collaboration and cooperation with conservation partners; and outreach) as summarized below:

- **Permitting**

  APG obtains federal and state permits as warranted in its management of migratory birds. These permits may include:

  - MDDNR Scientific Collecting
  - USFWS Special – Canada Goose, 50 CFR 21.26 (see Section 4.9.1.5)
  - USFWS Special Purpose – Salvage, 50 CFR 21.27
  - USFWS Non-Purposeful Take – Bald Eagle, 50 CFR 22.26 (see Section 4.9.1.4)

- **Inventory and Monitoring**

  APG personnel conduct annual baseline inventories of migratory bird species. Inventories are conducted by in-house volunteers of birding enthusiasts, and the extent of the surveys is therefore limited by the number of volunteers. Roadside survey routes are generally replicated every year to allow for year-to-year data comparisons. Each survey route has scheduled stops and at each stop, a 3-minute point count is conducted where every bird seen within a 0.25-mile radius

or heard is recorded. Survey stops include a variety of habitats to document maximum number of species. Annual inventories may include:

- Mid-Winter Count (December/January)
- Spring Migration Count (May/June)
- Whip-Poor-Wills Count (May/June)

Additional inventories are conducted when resources are available. Monitoring is conducted to support the military testing and training missions, and to evaluate the successes and failures of species management strategies. Monitoring may be required during the activity and after the activity to evaluate effectiveness of conservation measures in avoiding or minimizing impacts. Nesting ospreys and bald eagles are monitored frequently during nesting seasons, as both of these species are very common on the installation and often nest in very close proximity to military readiness activities and non-readiness operations. Other species or nests may be monitored as warranted.

- **Conservation Measures**

  APG's military readiness activities have the potential to affect or incidentally take birds through direct and indirect means. Explosive rounds impacting into grassland fields can disrupt nesting, foraging, or sheltering birds, and can alter the habitat by creating impact craters that eventually fill with water. Incendiary or other rounds can cause range fires that can result in incidental takes of birds.

  There are a number of range sustainment activities to maintain lines of sight, safety, and security that are considered essential to supporting military readiness activities. Range sustainment activities include herbicidal spraying, prescribed burning, mowing, and cutting of encroaching woody vegetation. To the extent possible and practical, these range sustainment activities are conducted outside of the migratory bird nesting season (15 March-15 August). However, due to availability of funding (particularly under Continuing Resolution Authority), there can be circumstances where these activities must occur within the nesting season. Consequently, migratory birds may be unintentionally taken as a result of these essential range sustainment activities.

  Non-readiness activities and operations are scheduled outside of nesting season to avoid impacting nests whenever possible. However, forestry management actions can inadvertently disrupt resident birds regardless of the time of year. Overall, impacts to birds from forest management activities are minimal, because 1) forest enhancement projects typically do not exceed 200 acres total each year, 2) at any one time forest management is only working in 0.005% of total forest cover, 3) individual forest enhancement projects are typically conducted in non-contiguous forest stands, 4) forest enhancement in a stand typically occurs once every 25 to 40 years, and 5) forest contractors report any bird nest findings with

global positioning system coordinates so that APG wildlife staff can inspect and assess nest activity. Forest management also includes leaving dead trees (logs and snags) and pockets of native understory for wildlife habitat, removing invasive species and vines which impair health of trees, expanding and improving riparian areas, and linking existing fragmented healthy stands - - all of which contribute beneficial impacts to birds.

Agricultural hay leasing can incidentally take birds, as hay cutting of warm season grasses is conducted during bird breeding season. Considerations of habitat and likely nesting species are included when scheduling habitat management activities.

As stated in the MOU, the DoD is responsible for implementing conservation measures that promote the conservation of migratory birds on military lands and waters, subject to availability of funding, and where in harmony with DoD missions. APG uses the NEPA process (see Section 3.4) to evaluate the potential of military readiness, essential range sustainment activities, and non-readiness activities to impact migratory birds, and to identify appropriate conservation measures to avoid or reduce impacts. Conservation measures generally address habitat protection and/or stressor management. The following are migratory bird conservation measures that are implemented on APG:

- Nest Removals – Inactive nests can be removed and disposed of at any time from buildings, vehicles, other infrastructure, and trees or shrubs. The NR staff is responsible for identifying the nesting bird species, and determining if the nest is active or inactive. The only exception is bald eagle nests which cannot be disturbed or removed without a USFWS permit.

- Prescribed Burns – Prescribed burning is used to reduce or remove encroaching woody vegetation, and maintain areas as grassland habitat for the benefit of both mission testing (line of sight) and grassland nesting birds. Prescribed burning is typically conducted in late fall to late winter/early spring for maximum effectiveness, thus avoiding impacts to most breeding birds.

- Firebreaks, Pre-Burns, and Bambi Buckets – Where available, roads or trails are used as firebreaks to keep range fires and prescribed burns out of forested areas. These control measures are necessary to avoid impacting forest nesting birds. Prior to prescribed burns, firebreaks (and other sensitive areas) are mowed and pre-burned to reduce fuel load. APG also keeps a helicopter equipped with a fire fighting Bambi bucket on standby during range fires and prescribed burns. With a Bambi bucket,

the helicopter pilot can deliver a concentrated column of water to control the spread of the fire.

- Herbicidal Spraying – Herbicidal spraying for common reed and sweetgum is typically conducted in late fall to late winter/early spring for maximum effectiveness, thus avoiding impacts to breeding birds.

- Nest Marking – Surveys may be conducted prior to an activity or operation in order to identify any bird nests. Nests are marked with a stand-off buffer so that activities or operations may occur while avoiding or minimizing disturbance to the nesting birds. Due to safety/access issues, limited manpower of the Natural Resources staff, and/or time-critical needs of activity or operation, nest marking is not always possible or feasible.

- Native Plantings – APG's Real Property Master Plan addresses native plantings as preferred sustainable habitats, which can also support migratory bird populations.

- Vegetation Removal – Non-essential maintenance or other vegetation/tree trimming is not conducted 15 March through 15 August, unless a survey confirms the absence of nesting birds in the affected trees/vegetation. Non-essential maintenance includes, but is not limited to, power line right-of-ways and landscaping.

- Artificial Nesting Platforms – APG has installed artificial nesting platforms for ospreys throughout the installation to discourage ospreys from nesting on electrical infrastructure and getting electrocuted and/or causing power outages. Power outages can impact critical mission operations and surety buildings.

- Electrical System Retrofits – APG's extensive network of electrical infrastructure (poles, conductors, etc.) has been retrofitted with avian protective devices to reduce the potential for bird collisions and electrocutions. APG periodically replaces any protective devices that break loose or fail (particularly flight diverters). Bird strikes can potentially cause power outages which can impact critical mission operations and surety buildings.

- Towers/Guy Wires – Short (less than 100-foot high) towers are often erected as part of testing and training missions at APG. Depending on location and specific equipment set-up, tower guy wires may be marked with flagging or other visual deterrent to reduce the potential for bird collisions. Towers are lowered to the ground at the end of each day, if testing/training scenario allows, and the ground underneath and

surrounding the tower is visually inspected each day to monitor for line strikes. Equipment may also be re-located to another suitable area away from dense bird activity that still accommodates the testing/training objectives.

- Minimal Use of Insecticides, Herbicides, Rodenticides – Use of chemicals in management of insects, rodents, and vegetation is implemented after physical, mechanical, and cultural are proven ineffective. Only the minimum amount of chemical is used to achieve control standards. Any application of chemical in sensitive natural areas is coordinated with the DPW Natural Resources staff.

- Road Kill Carcass Removal – Animal carcasses are removed from roadways and test tracks and placed at designated disposal sites on the installation. These disposal sites are removed from vehicular traffic, power lines, and other stresses that could impact scavenging raptors.

- Surveys and Monitoring – See above under "Inventory and Monitoring"

The following are additional migratory bird conservation measures that are proposed for implementation:

- Reduced Mowing During Breeding Season – A reduced mowing schedule will be developed for specific areas of the installation. Mowing of these areas will be avoided during peak breeding season to allow for undisturbed nesting of grassland birds. Reduced mowing will also result in a cost savings to ground maintenance.

- Artificial Nesting Platforms and Boxes – There are some abandoned poles on Spesutie Island that can accommodate osprey nesting platforms without conflicting with test missions. Nesting platforms will be installed on these poles and also some deteriorated platforms on other poles that are not associated with energized lines will be replaced. Additionally, one or two barn owl nest boxes will be installed to encourage owls to nest away from test structures, avoiding potential mission conflicts in the future. Previous efforts that targeted wood duck and bluebird nest boxes have ceased, but could be reinstituted with a staff of volunteers. If existing bluebird boxes are no longer monitored, then the boxes will be removed to avoid promoting nesting of invasive house sparrows.

- Bird Friendly Buildings, Building Glass and Lighting Design – New guidance (USFWS 2016) for reducing bird collisions and impacts will be incorporated into Master Planning documents. Outreach will be provided to educate workers and tenants on importance of turning off interior

lighting at night in windowed offices. Turning off unnecessary lighting will also result in a cost savings to power usage.

- Feral Cats – Outreach will be provided to educate residents, workers, and tenants on importance of keeping cats indoors, not feeding feral cats, and reporting any sightings of feral cats.

- Fishing Line Receptacles – Receptacles for spent fishing line (monofilament and hooks) will be provided at fishing piers and other appropriate locations on the installation. Public outreach will be provided to educate anglers on the hazards to birds and other wildlife from improperly discarded fishing line.

- **Wildlife Aircraft Strike Hazard Abatement**

  see Section 4.10

- **Collaboration and Cooperation with Conservation Partners**

  The DoD PIF program sustains and enhances the military's testing, training, operational, and safety missions throught proactive, habitat-based management strategies that maintain healthy landscapes and testing/training lands. DoD PIF representatives provide assistance to installation natural resources managers for monitoring and inventory, research and management, and education programs involving birds and their habitats. DoD PIF offers a wide variety of resources to help natural resources managers better comply with relevant laws and policies, and incorporate migratory bird information into installation INRMPs. DPW Natural Resources staff attend DoD PIF webinars and trainings whenever possible, attend the National Military Fish and Wildlife Association (NMFWA) annual training workshop as funds allow, and are members of NMFWA/DoD PIF bird conservation working groups. These opportunities help to keep the APG staff abreast of current migratory bird issues, policies, and challenges that impact DoD missions.

  The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS)-Wildlife Services provides federal leadership and expertise to resolve wildlife conflicts that threaten public health and safety. One of their goals is the reduction of bird/aircraft collisions at airfields. APG will coordinate with the APHIS-Wildlife Services, as warranted, in helping the MDARNG develop a Bird/Wildlife Aircraft Strike Hazard plan.

  APG will continue to engage the USFWS and MDDNR during annual INRMP reviews to evaluate the effectiveness of conservation measures and develop cooperative efforts to conserve migratory birds, while ensuring the sustainment of the APG's military mission.

- **Outreach**

  Installation safety and security requirements hinder public access for bird watching and photography on APG. DPW Natural Resources staff are involved in educational presentations (on and off-Post) and news articles in the APG News to foster public awareness of migratory birds and other wildlife. Inquiries for bird watching opportunities are directed to surrounding off-Post venues (Susquehanna State Park, Conowingo Dam, Anita C. Leight Estuary Center, Marshy Point Nature Center, Harford Bird Club, etc.).

4.9.4 Bald Eagles

4.9.4.1 Regulatory Background

The bald eagle (*Haliaeetus leucocephalus*) was listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966, the precursor to the Endangered Species Act of 1973. Under federal protection, and with banning of the chemical pesticide DDT in 1972, the species had a significant population recovery. The federal status of the bald eagle was downgraded to "threatened" in 1995, and the species was federally delisted from the Endangered Species Act in 2007. In 2010, the bald eagle was removed from Maryland's list of endangered and threatened species.

The bald eagle remains federally protected under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act. Both regulations prohibit possession of eagles (and their parts), nests, and eggs, and specific actions that result in "take" of eagles. The BGEPA extends prohibitions to any disturbing activities that cause nest abandonment or decrease an eagle's productivity by substantially interfering with normal breeding, feeding, or sheltering behavior.

> "Take" under BGEPA is defined as: to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or *disturb* a bald eagle (or golden eagle), or attempt to engage in any such conduct
>
> "Disturb" under BGEPA is defined as: to agitate or bother a bald eagle (or golden eagle) to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior
>
> "Incidental take" is defined as: take that results from, but is not the purpose of, carrying out an otherwise lawful activity

The purpose of APG's bald eagle management program is to ensure the sustainment of the military mission while avoiding or minimizing impacts to eagles to the maximum degree practicable. Any incidental take must be in compliance with the BGEPA.

APG's former Bald Eagle Management Plan (last revised in 2009) is replaced with this updated section of the INRMP.

4.9.4.2 USFWS Consultation History

Recognizing the potential for mission activities to impact the bald eagle population, APG has consulted informally and formally with the USFWS since the early 1980s. Early consultations resulted in the development of APG's first bald eagle management plan in 1986.

4.9.4.2.1. Endangered Species Act Section 7 Biological Assessment, Biological Opinion, and Incidental Take Statement (2005 – 2009)

During 2002-2004, APG documented a significant increase in eagle mortalities attributed to collisions with overhead power lines. In January 2005, the Army prepared and submitted a Biological Assessment to the USFWS pursuant to the Endangered Species Act, Section 7(c)(1) to evaluate the potential effects of activities at APG on the bald eagle. The USFWS issued its Biological Opinion in December 2006, finding that "…actions at APG are not likely to jeopardize the continued existence of the bald eagle". The Biological Opinion granted APG a take allowance for eagle mortalities and nest disturbances that resulted incidentally from mission activities. Specifically, APG's incidental take statement allowed an average of six eagle mortalities per year not to exceed 18 in a three-year period, and three nest disturbances per year. Under the Biological Opinion, APG was required to comply with specific terms and conditions to reduce eagle mortalities and disturbances. These terms and conditions included installing avian deterrents and protective devices on power lines and poles, burying overhead power lines in select areas, establishing buffer zones around nests and roosts, and conducting long-term biological studies.

4.9.4.2.2. BGEPA 22.28 Permit for Take Exempted Under Endangered Species Act (2009 – 2013)

After the bald eagle was delisted from the Endangered Species Act in 2007, APG was issued a Title 50 Code of Federal Regulations (CFR) Part 22.28 permit in 2009 which "grandfathered" the Endangered Species Act incidental take allowance in under the BGEPA. The permit required continued compliance with the incidental take statement, terms, and conditions of the Biological Opinion.

In 2011, it became evident to APG and the USFWS that APG would likely exceed its incidental take allowance for mortalities. From 2006 to 2011, APG's eagle nesting population nearly doubled. As a result, the number of incidental takes increased with the eagle population, despite the implementation of the protective measures required under the Biological Opinion. The USFWS provided APG with two permit options: 1) request increase in take allowance authorized by 22.28 permit, or 2) develop programmatic permit under Title 50 CFR Part 22.26 to authorize a higher take allowance.

4.9.4.2.3. BGEPA 22.26 Permit for Incidental Programmatic Take (2011 – present)

In 2011, APG formally submitted to the USFWS a request for a Title 50 CFR Part 22.26 programmatic permit for eagle take and an opportunity to re-negotiate (increase) the incidental take allowance. The USFWS defines programmatic take as "take that is recurring but not caused solely by indirect effects, and that occurs over the long-term and/or in a location or locations that cannot be specifically identified." Due to the on-going military mission and the increasing population of eagles, it is unlikely that the incidence of eagle take at APG can be entirely eliminated despite the implementation of minimization measures. Therefore, a programmatic permit best serves the needs of APG.

Before a programmatic permit could be issued, APG's 22.28 permit expired in 2013. APG continued to operate in accordance with the terms and conditions of the Biological Opinion, while remaining at or slightly over the incidental take allowance for mortality. The USFWS indicated that because APG was in the process of obtaining a programmatic permit and continued to demonstrate good faith efforts, APG mission operations could continue, despite any non-intentional take incurred before issuance of the programmatic permit.

The USFWS issued the 22.26 permit to APG in 2017. This new permit replaces the expired 22.28 permit, and supersedes the incidental take statement, terms, and conditions of the 2006 Biological Opinion. The new permit authorizes a higher incidental take allowance to account for the expanding eagle population at APG. In addition, the new permit addresses more sources of potential take, and allows greater flexibility in managing the eagles through adaptive management, than provided under the Biological Opinion. The permit is valid for 5 years, with an option to renew every 5 years.

The permit does not authorize nest removals. A nest removal authorization will be considered by the USFWS on a case-by-case basis and require an additional or amended permit.

Appendix M contains APG's Eagle Conservation Plan (ECP) which was required in support of the programmatic permit application. The application process for a programmatic eagle take permit required submittal of specific supporting information, including the presence of eagle use areas in the vicinity of the project, the risk to eagles from the project, current mitigating conditions for reducing take, and proposed avoidance and minimization measures to further reduce take to the maximum degree practicable. The USFWS encouraged applicants to submit this information as an ECP following a USFWS template. The use of the template ECP allowed for the USFWS's expeditious review of the application materials. The ECP does not replace this bald eagle section of the INRMP, but merely supported the issuance of the programmatic permit.

Current BGEPA Permit Authorizations and Conditions:
Authorizations
1) Incidental Take – Up to 70 bald eagles over 5-year duration of permit due to collisions with electrical and other human-made infrastructure, collisions with ground and aerial vehicles (both manned and un-manned), and other unforeseen impacts resulting incidentally to mission activities 2) Incidental Nest Disturbance – Up to 3 bald eagle nests per calendar year due to incidental harassment of adults leading to abandonment of nest and loss of productivity for the given year, inclusive of eggs and young
Conditions (Avoidance and Minimization Measures)
1) Inspect and routinely maintain avian deterrents and protective devices on power lines and poles 2) Bury power lines underground at areas of greatest eagle mortality occurrences, where feasible and as funds allow 3) Monitor live fire shoreline training exercises and execute stand-down procedures should an eagle fly into firing zones 4) Conduct installation activities and operations in accordance with Bald Eagle Management component of INRMP – Follow APG standardized protocol for monitoring eagle activity in support of population, productivity, and disturbance surveys – Follow APG standardized protocol for investigating eagle injuries and mortalities 5) Make continuous effort to eliminate attractants and other physical properties that may draw eagles to nest locations on human-engineered structures or in locations posing health or safety risks to people or eagles

4.9.4.3 Bald Eagle Distribution at APG

With approximately 135 miles of shoreline, much of it forested, APG has played a significant role in the regional recovery of bald eagles. APG is located within the Upper Bay Bald Eagle Concentration Area, one of several concentration areas for bald eagles in the Chesapeake Bay (Watts and Mojica 2009a). APG attracts a disproportional number of eagles within the concentration area, because the installation has largely undeveloped forested shorelines with abundant food resources in the surrounding rivers and Bay. In addition, many of these shoreline areas have restricted access with little human activity. These shorelines provide optimal habitat for foraging, roosting, and nesting bald eagles. Residential and commercial development of surrounding shorelines in the northern Chesapeake Bay continues to drive an increasing number of eagles to APG.

APG is a convergence area for eagles, supporting not only year-round resident breeding and non-breeding eagles, but also migratory eagles from northern and southern territories of the U.S. and Canada. In late spring and early summer, post-nesting and subadult eagles migrate north from Florida and other southeastern states to

spend the summer months in the Chesapeake Bay area, while eagles from northeastern Canada and the U.S. migrate to the area during late fall and early winter. The number of eagles on the installation is estimated to be highest during the winter months (January-March) and the summer months (June-July) due to influx of northern and southern migrants, respectively (Watts and Mojica 2009b). It is estimated that a few hundred eagles are on APG at any one time, and that at least several hundred eagles utilize the installation throughout the year.

APG has monitored the bald eagle population on the installation since the mid-1970s utilizing population surveys, roost surveys, and nest surveys. These surveys have been supplemented with an extensive three-year eagle movement study using satellite telemetry. These efforts have resulted in a comprehensive database of eagle movement, population dynamics, and productivity on APG that also provides a broader understanding of eagle dispersal/movement and roost behavior throughout the Chesapeake Bay.

4.9.4.3.1. Foraging and Loafing Areas

Bald eagles generally use shoreline areas with suitable trees for perching, as areas for daytime foraging and loafing. The densest concentrations of eagles are routinely observed along the shorelines of the Bush River, Spesutie Island, and Pooles Island. Bald eagles primarily forage for fish, but will also eat ducks, turtles, and small mammals. During winter when prey fish move to deeper water and open water freezes, eagles may move inland and scavenge road-killed animals and other carrion.

4.9.4.3.2. Roosting Areas

Non-breeding eagles are typically gregarious and establish communal roosts (areas where eagles gather and perch overnight, or during inclement weather). Communal roosts are typically isolated from human disturbance, contain large trees (live or dead) for perching, positioned in areas protected from harsh weather, and have a clear movement corridor between the roost and primary foraging areas. A number of communal roost areas have been identified and delineated on APG through ground surveys and satellite telemetry data. Communal roost areas can be classified as year-round or seasonal based on usage. Year-round roosts are utilized throughout the year and are located further inland than the shoreline foraging and loafing areas. The most heavily used year-round roosts are located along Cod Creek, Coopers Creek, Doves Cove, Mosquito Creek, Romney Creek, and Woodrest Creek. Numerous seasonal roosts supplement the roost network. The satellite telemetry data indicate that eagles at APG move in and out of roost areas throughout the day, and may not utilize the same nighttime roost area from night to night (Watts and Mojica 2009b). This network of year-round and seasonal communal roost areas is dynamic and can change over time depending on factors such as distribution of prey, loss of perch trees, or other changes to the habitat.

4.9.4.3.3. Nesting Areas

Bald eagles exhibit high nest fidelity and nest territories are often used year after year. The majority of the nests on APG are located in large trees with a clear view of shoreline foraging areas, or if located further inland, within one mile of a suitable foraging area. Eagles generally choose the tallest trees with strong support limbs and an open canopy to allow easy maneuvering in and out of the nest. Artificial structures on APG (i.e., towers) have been used infrequently for nesting by bald eagles. Nests can be quite large, 3 to 6 feet wide and 3 to 4 feet deep, especially if maintained year after year by a breeding pair. It is not uncommon for a nesting territory to include one or more alternate nests in addition to the active nest. Multiple nests may be built or maintained by the breeding pair, but only one nest is selected for laying eggs and raising young.

Breeding activity at APG typically begins in November with courtship behavior and building or repairing of the nest by the adult pair. One to three eggs are laid in late January to late March and incubated by the adults for about 35 days until hatching. Once hatched, the eaglets remain in the nest for 10 to 12 weeks before finally fledging (leaving the nest and beginning to fly). The majority of nests are fledged by mid-June, but some nests may fledge earlier or later depending on when eggs were laid. After fledging, young eagles are still dependent on the adults for food and will stay in the vicinity of the nest and return periodically to the nest over several weeks. Over the course of about 6 weeks, the young eagles learn to forage independently and disperse from the nesting territory.

Typical Chronology of APG Breeding Eagles:

Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Courtship, Nest Building								
			Egg Laying, Incubation					
				Hatching, Raising Eaglets				
							Fledging	

During nesting season, eagles can be sensitive to a variety of human activities. At the start of nesting season, an eagle pair may not return to the nest site if the nest tree or surrounding habitat has been significantly altered. Early in the nesting season, human activities that cause prolonged absences of adults from their nests can jeopardize eggs or young. Depending on weather conditions, eggs may overheat or cool too much and fail to hatch. Additionally, unattended eggs and eaglets are subject to predation. Young eaglets are particularly vulnerable, because they rely on their parents to provide warmth or shade, without which they may die as a result of hypothermia or heat stress. If food delivery schedules are interrupted, the eaglets may not develop healthy plumage, which can affect their survival. In addition, adults startled while incubating or brooding young may damage eggs or injure their young as they abruptly leave the nest. Older nestlings no longer require constant attention from the adults, but they may be startled by loud or intrusive human activities and prematurely jump from the nest before they are able to fly or care for themselves.

Sensitivity of Breeding Bald Eagles to Human Activities[(a)]:		
Activity	Sensitivity to Human Activity	Comments
Courtship and Nest Building	Most sensitive and critical period; likely to respond negatively	Disturbance is manifested in nest abandonment; eagles in newly established territories more prone to abandon nest sites
Egg Laying	Very sensitive period	Human activity of even limited duration may cause nest desertion and abandonment of territory for breeding season
Incubation and Nestlings, up to 4 weeks	Very sensitive period	Adults less likely to abandon nest near and after hatching; however, flushed adults leave eggs and young unattended; eggs are susceptible to cooling, loss of moisture, overheating, and predation; young are vulnerable to elements
Nestlings, 4 to 8 weeks	Moderately sensitive period	Likelihood of nest abandonment and vulnerability of nestlings to elements somewhat decreases; however, nestlings may miss feedings, affecting their survival
Nestlings, 8 weeks through fledgling	Very sensitive period	Gaining flight capability; nestlings may flush from nest prematurely due to disruption and die

(a) USFWS 2007

4.9.4.3.4. Population Trends and Status

APG has documented a tremendous increase in the number of bald eagles on the installation. In 1977, APG had only one known pair of nesting eagles. By 2006, there were nearly 30 breeding pairs that fledged a total of 41 chicks. By 2015, the APG nesting population (measured as number of active nests) had nearly doubled. The productivity (measured as total number of chicks fledged) had more than doubled in the same time period. From 2011-2015, APG's breeding population of eagles remained fairly steady, producing a yearly average of 51 active nests and 87 chicks. Mid-winter population surveys also indicated an increase in eagle numbers on APG and the surrounding areas since the early 1980s, with a general stabilization of mid-winter numbers in recent years (average of 196 eagles counted from 2011 to 2015).

Since 2015, the number of active nests on APG has again increased. In 2018, APG had a record high of 75 active nests with 110 chicks fledged. Nesting habitats which for many years contained only a single active nesting pair are now known to contain two or more pairs in very close proximity. APG has several overlapping nesting territories each with a pair of nests only 300 to 600 meters apart (less than 0.5 miles). There have

even been recent occurrences on APG of eagle pairs nesting and successfully raising young within 100 meters of each other. With the establishment of more compressed territories, many eagle pairs at APG have developed a tolerance to routine and on-going mission activities, with some pairs building nests and raising young within 200 meters of active range areas. As habitat becomes more and more limited, it is possible that eagles may seek out towers and other artificial structures as nesting substrates, increasing the potential for mission conflicts.

Although the number of nests continues to increase, chick production remains at or near past averages (excluding 2018 record numbers). Several factors can impact number of eggs laid and chicks produced. The availability of prey is an important factor, as more nests equates to more eagle pairs foraging for food. Eagles already fight amongst themselves for fish, but they also have to fight off ospreys which try to take food away. If an adult female eagle is not well fed and nourished, then she may be less likely to lay multiple eggs. Additionally, if food is limited, then the oldest chick usually wins out over its younger hatchlings. More eagle pairs also mean more possibility of territorial fights and predation. New eagle pairs may attack other nesting pairs trying to evict the pair from a nest, even killing eggs and chicks. An eagle pair is likely spending more time at the nest defending their territory and less time foraging. Weather can also be a factor. If waters are frozen over for an extended period of time, then foraging opportunities will be limited and may force eagles inland, and further from territories, to forage for small mammals or road-killed carcasses.

4.9.4.4 Adaptive Management for Mission Sustainment

APG has some of the highest quality habitat for bald eagles in the Chesapeake Bay region, and the installation will un-intentionally remain an area of significant importance to the local and regional eagle populations. However, it is critical that species management allows mission activities and installation operations to continue with minimal restriction, to the extent practicable, and in compliance with APG's BGEPA permit. In addition, management strategies should provide protection to bald eagles, while promoting ecosystem-level benefits (multiple species protection, riparian habitat protection, forest stand enhancements, etc.).

APG utilizes adaptive management to address allowable activities in the vicinity of eagle nests and roosts, taking into consideration routine and customary activities. Adaptive management promotes flexible decision making that can be evaluated and adjusted based on outcomes of management actions and other events. Adaptive management has allowed APG to transition its eagle management program from a formerly rigid and highly conservative management strategy to one that emphasizes reasonable measures to protect the eagles and habitat, while sustaining the military mission.

Since 2009, APG's eagle management program has considered the installation's sustainable baseline nesting population to be at least 42 nest territories (APG 2009). The decision to use 42 as the baseline number of nest territories was based on the installation's historical data trend and the regional (Chesapeake Bay) population of eagles at that time. In the future, should the number of nest territories at APG fall below

this number, then management strategies may need to be evaluated to determine if more conservative approaches to species protection are warranted, while still ensuring mission sustainment. Conversely, if the eagle population continues to increase, then management strategies may continue to be refined to further reduce restrictions on mission activities, while still adequately protecting the species. Consideration must be given to natural stressors, installation productivity versus regional productivity, mission sustainment, and compliance with BGEPA permit when proposing any changes to management strategies.

To avoid disturbances to eagles, APG implements a combination of habitat buffers, activity buffers, and time restrictions around bald eagle use areas. These buffers and time restrictions are detailed in the following sections.

4.9.4.4.1. Protection of Nesting Areas

Nesting Season (15 December – 15 June)

For planning purposes, bald eagle nesting season at APG is designated as 15 December – 15 June. The actual end date is specific for each nest and is the date that the last chick fledges; the end date may be before or after 15 June.

Nest Map

A current map of nest locations is available from the Natural Resources Team (Eagle Program Manager) or Garrison GIS. The nest map is generated at the start of every nesting season, and is updated as needed throughout nesting season.

Habitat and Activity Buffers

APG establishes protective buffer zones around documented nest trees. The buffers serve to protect the nest tree and associated habitat, and minimize visual and auditory impacts associated with human activity near the nest site.

Nest Buffer Restrictions:
1) Habitat alteration is prohibited year-round within 200 meters (660 feet) of nest trees. Habitat alteration includes land clearing, new road construction, new building construction, and other actions that result in a significant change to the habitat.
2) Ground activities are prohibited within 200 meters of active nest trees during nesting season.
3) Aerial activities are prohibited within 150-meter (500-foot) altitude of active nest buffers during nesting season.

Exceptions to these restrictions may be warranted depending on the following:

- Nature and magnitude of activity – The potential impact of an activity on nearby eagles can depend on the noise associated with the activity, number of workers, equipment, duration of activity, time of day, and specific time within nesting season. Emergency (life and safety) activity is allowed within the buffer, but

DPW Natural Resources Team (Eagle Program Manager) must be notified as soon as possible, as the activity may result in an incidental take. Ground monitoring of an eagle nest by experienced DPW Natural Resources Team observers is allowed within the buffer. Likewise, aerial monitoring by experienced pilots and observers is allowed within the buffer with no hovering directly over the nest.

- Visibility of activity from nest – In general, eagles are more prone to disturbance when an activity occurs in full view, rather than if shielded by trees, buildings, or other screening. The 200-meter buffer may need to be increased in open areas to minimize potential for disturbance.

- Tolerance of eagles to existing activity – Eagles are less likely to be disturbed by routine use of roads, housing, ranges, and other facilities where such use pre-dates the eagles' nesting activity in a given area. Therefore, routine pass-through vehicular and pedestrian traffic and on-going operational activities (approved through the NEPA process) are not restricted within buffers. Alternatively, activities that are intermittent, occasional, or of irregular nature may have the potential to disturb eagles.

APG's nest surveying protocol provides an efficient, thorough, and timely means of detecting new nests. As new nests are discovered and previously active nests fall into disuse, protective buffers (habitat and activity) are adjusted accordingly.

- If a nest falls completely from the tree outside of nesting season, the protective buffer is removed from that nest tree.

- If a nest falls completely from the tree during nesting season or if only a portion of a nest falls at any time from the tree, the protective buffer remains.

- A newly discovered nest is assessed for eagle activity prior to implementing a protective buffer. A buffer is not implemented until an eagle is observed in the nest tree or the nest itself, to ensure that the nest is indeed an eagle nest and not occupied by another raptor (owl or hawk).

- If a nest (or recognizable portion of nest) remains in the tree but is not maintained or used for four consecutive nesting seasons, then the protective buffer is removed from the nest tree.

Determination of Active Nest

"Active nest" is defined by the USFWS (2007) as: a nest that is built, maintained, or used by a pair of eagles during the nesting season, whether or not eggs are laid

For the purpose of protecting a potentially active nest site from disturbance, a nest on APG is automatically considered provisionally active at the start of nesting season, if the nest was active at any time during the past 4 nesting seasons. For a nesting territory that includes one or more alternate nests, the nest that was most recently active will be considered provisionally active at the start of nesting season. The alternate nest(s) will be considered inactive.

A final determination of active/inactive nest is made on or about 1 April by aerial survey. A nest is considered inactive if there are no eggs/chicks and no adult in incubating posture. Once a nest is determined to be inactive, activity restrictions are removed for that nest buffer for the remainder of that nesting season, but restrictions to habitat alteration remain.

Determination of Failed Nest

"Failed Nest" is defined as: a loss of productivity for a given nesting season

A nest which has eggs/chicks on or before 1 April, or adult in incubating posture on or about 1 April, but later in the same nesting season becomes inactive, is considered a failed nest. A nest failure can be due to natural causes (predation, inexperienced breeding pair, tree limb breakage, etc.), logistical issues (inability to confirm presence of eggs or chicks by aerial survey), or can be a result of an incidental take. APG utilizes a collection of evidence to determine the likely cause of a nest failure, including but not limited to nest monitoring data, installation activity records, range activity records, and meteorological data.

Barricades and Signs

APG places a limited number of road barricades to restrict access into some nest areas at the start of each nesting season on 15 December. These barricades are generally limited to small infrequently used access roads that pass very close to the nest tree. Either wooden barricades with eagle placards or yellow caution tape are used.

For nests located within 200 meters of roads that must remain open to pass-through traffic, road signs are posted indicating 200-meter buffers and advising drivers to avoid stopping within the buffer area:

For nest trees located in open hunting areas, signs are posted in the woods to delineate the 200-meter distance from the nest tree:

4.9.4.4.2. Protection of Roosting Areas

Roosting Hours (Sunset – Sunrise)

For planning purposes, roosting hours are from sunset to sunrise every day. However, eagles tend to retreat to roost trees before sunset, up to an hour earlier. In addition, inclement weather may force eagles to seek shelter in roost trees at other times of the day.

Roost Map

A current map of roost locations is available from the Natural Resources Team (Eagle Program Manager) or Garrison GIS.

Habitat and Activity Restrictions

The network of year-round and seasonal roosts is too extensive and too dynamic to implement protective buffers around each roost. However, the roost itself, as delineated by the most recent satellite telemetry data and ground observations, remains protected from habitat alteration and activity.

Roost Restrictions:
1) Habitat alteration is prohibited year-round within delineated roost. Habitat alteration includes land clearing, new road construction, new building construction, and other actions that result in a significant change to the habitat.
2) Ground activities are prohibited during roosting hours within delineated roost.
3) Aerial activities are prohibited within 150-meter (500-foot) altitude of delineated roost during roosting hours. Exceptions are made for long-standing established flight patterns utilized by MDARNG and ATC for testing and training. These flight patterns include MDARNG training maneuvers in the Lauderick Creek Training Area, and ATC testing maneuvers around the Phillips Army Airfield. These training and testing maneuvers have apparently had no impact on the eagles, based on eagle survey data.

Roost restrictions are in place, because human activities within roost sites may prevent eagles from taking shelter, especially if there are no other undisturbed roosting sites available. Such activities would constitute a violation of the BGEPA's prohibition

against disturbance. However, APG's extensive network of roosts allows for flexibility in accommodating short-term (or even long-term) activities and operations.

Roost areas can be dynamic and change over time. Therefore, restrictions associated with a previously delineated roost area may be re-evaluated in light of new data.

4.9.4.4.3. Protection of Foraging Areas

Foraging areas are not explicitly protected at APG, due to the expanse of forested shorelines and waters used by eagles and the difficulty in restricting and enforcing access and activities within so many areas. In addition, eagles at APG continue to thrive which indicates no need for increased restrictions regarding foraging areas. Long-term protection and preservation of mature shoreline trees is recommended, not only to benefit eagles and other wildlife, but to conserve riparian habitats for the benefits of reducing shoreline erosion, maintaining water quality, and restricting viewsheds of inland range areas.

Specific activities may be evaluated on a case-by-case basis for potential impacts to foraging eagles. A human activity that persistently disturbs foraging eagles could result in nest failure due to the inability of eagle pairs to deliver sufficient food to their nestlings.

4.9.4.4.4. Specific Mission Activity and Operational Considerations

APG utilizes its NEPA process for environmental reviews of all installation projects to ensure that potential impacts to eagles are minimized or avoided. Depending on the activity, minimization measures may include delaying the activity until outside nesting season, relocating the activity to outside an eagle use area, or conducting eagle monitoring concurrent with the activity. Specific practices have been developed for the following activities and operations.

Power Lines and Poles

Eagles are killed by overhead electrical components in two functionally different ways. The first (pole electrocution) occurs when an eagle perches on a utility pole cross arm and is electrocuted when different body parts touch elements that complete the electrical circuit. The second (line strike) occurs when an eagle flies into overhead wires and is either killed by the trauma of striking the wire or is electrocuted when its wings complete a circuit between two wires. The installation of avian deterrents and protective devices on electrical infrastructure has been a cost effective measure that significantly reduces the number of eagle mortalities on APG. The deterrents and devices are nearly maintenance-free, except for the spinning flight diverters which need periodic replacement as the swivel assemblies fail. Several versions of the diverters have been field tested at APG, and the latest version (FireFly® FF) with a large stainless steel ball bearing swivel has proven to be the most durable.

The majority of APG's overhead power lines and associated poles are retrofitted with avian deterrents and protective devices including: 1) FireFly® FF diverters on wires; 2) elevated perches or perch excluders on cross arms; and 3) insulating covers on

wires, conductors, cutouts, and bushings. Alternative marking devices for the power lines may be considered as long as the alternatives are as or more effective than the FireFly® FF units in reducing line strikes.

Line burial has been the most effective measure to eliminate line strikes at APG, but also the most expensive. Due to the very high costs of implementation, it is not feasible to bury all overhead lines at APG. The following sections of existing overhead lines are prioritized for burial efforts based on areas of densest eagle activity and occurrence of line strikes:

Prioritized Areas for Power Line Burial:

- Aberdeen Area – Woodpecker Road (Boat House to Causeway)
- Aberdeen Area – Old Baltimore Road (Michaelsville Range to C Tower)
- Aberdeen Area – Old Baltimore Road (UNDEX to Abbey Point Road)
- Edgewood Area – Maxwell Point Road (peninsula)
- Edgewood Area – Watson Creek Road (crossing Watson Creek)
- Edgewood Area – Ricketts Point Road (I-Field to J-Field)

Given the limited availability of funding and the very high costs associated with burying overhead lines, line burial will only be considered after other minimization measures such as avian deterrents/protective devices have proven ineffective. Efforts should continue to emphasize line burial for new projects that are close to shoreline foraging areas, including range re-development where burial would remove overhead obstructions which could hinder mission testing.

Weapons Firing

Surface Danger Zone (SDZ) maps are developed by ATC Range Control for all live firing scenarios. A SDZ is a designated area that protects personnel and property from the dangers of live firing (projectile impacts, dispersion, ricochets, fragmentation and debris, backblast, overpressure, and noise). The SDZ map shows the firing point, direction of fire, impact area, and other relevant features including nearby eagle nests and roosts. These SDZ maps are available for review when evaluating potential for adverse effects to eagles. Generally, eagles at APG have proven to be tolerant of noise associated with weapons testing, and have nested successfully within close proximity to active range areas. However, the following restrictions are considered minimally prudent for avoiding nest disturbances and damaging habitat trees (including nest and roost trees):

Minimization Measures for Weapons Firing:

- To maximum extent possible, avoid impacts of inert and high explosive rounds within 200-meter nest buffers during nesting season
- To maximum extent possible, avoid impacts of inert and high explosive rounds within delineated roosts and within trees of 200-meter nest buffers year-round

Shoreline Training Exercises

Shoreline training exercises refer to live firing from watercraft to shoreline targets as a training scenario for military units. The training scenario may include additional components, such as air support (live and inert firing from fixed and rotary-winged aircraft), swimmer insertion and extraction, and over the beach (beach landing by foot to engage inland targets). APG developed, and continues to refine, a specific set of measures to minimize impacts to bald eagles during shoreline training exercises. These minimization measures are listed below. These measures may also be applied to testing programs that utilize ship-to-shore live firing, depending on specific parameters of test program.

Minimization Measures for Shoreline Training Exercises:

- Conduct continuous daytime monitoring and logging of eagle activity by experienced observer on patrol boat, including nearshore boat patrols immediately prior to start of exercise and continual scans of shoreline and trees for eagles; observation log must include:
    1) Weather conditions
    2) Clearance designations, time opened and closed
    3) Firing activity starts and stops
    4) Other observations of firing and training activities
    5) Bald eagle activity observed, including locations of eagles prior to exercise and when eagles leave training area
- Test Director will confer with observer prior to opening clearance
- Observer has authority to temporarily halt firing if eagle flies into immediate danger zone, if potentially disturbing activity is observed, or if eagle disturbance is observed
- Establish level of activity prior to start of live firing and maintain activity during periods of non-firing to deter eagles from entering training area, especially up to and during sunset, using:
    1) Propane cannons on shoreline that are programmed to fire intermittently; on-demand cannons may also be used in combination with programmed cannons
    2) Nearshore boat maneuvers by either patrol boat or training unit watercraft
    3) Nearshore boat horns and sirens
- Fire short bursts at shoreline targets, at discretion of observer, to allow eagles not visible to observers to fly out of immediate danger zone before start of steady firing
- Protect nest tree to maximum extent possible by avoiding direct lines of fire toward nest tree; static (versus dynamic) firing and training and/or reduced range (versus standard) ammunition should also be considered to further minimize risk to nest tree

Removal of Road-Killed Animals

Eagles will forage on road-killed animals, especially during the winter when fish and other prey are harder to catch. It is important to reduce the potential for an eagle take due to a vehicular strike by removing carcasses from roadways.

Minimization Measure for Road-Killed Animals:
• Road-killed animals should be removed from the roadway as soon as possible and carcasses deposited in a remote area away from power lines, roads, test tracks, and runways

The DoO Conservation Law Enforcement Office must be contacted before moving a carcass of a protected species (bald eagle, other bird species protected under the Migratory Bird Treaty Act, or any animal protected under the Endangered Species Act).

Habitat Improvement and Conservation

APG continues to lose nest trees every year due to storms and natural degradation, occurrences which can be indicative of declining forest health. Some forest stands do not have sufficient number or quality of canopy trees which can serve as alternate nest trees if the original nest tree falls. Without a planned holistic management of the forest stands, nest trees will continue to fall without being replaced, and eagles may be forced to establish new territories in closer proximity to mission activities, and even on human-engineered structures (towers, platforms, etc). Some of these new nests may directly conflict with mission operations and/or pose a risk to human or eagle safety.

To this end, APG's forest management program implements prescriptive silvicultural practices to maintain or improve the health of existing forest stands, with the goal of sustaining the testing and training landscape required by the military mission. By focusing on existing forest stands, no new eagle habitat is created through forestry practices. Forest stand improvements benefit eagles by ensuring the long-term health of existing and future nest and roost trees. A healthy forest stand also benefits other wildlife, helps to reduce erosion, maintains water quality, and restricts viewsheds of inland range areas.

Through its ACUB program, APG works with conservation partners to encumber off-site land adjacent to, or ecologically connected to, the installation to limit development and encroachment. While the primary goal of the ACUB program is to sustain the mission by limiting encroachment, the program can also secondarily protect forested shoreline habitat and ultimately benefit the bald eagle population. Conserved off-post land parcels can help to relieve the population pressure of the eagles on the installation and reduce potential for mission conflicts.

4.9.4.5 Monitoring and Reporting

All monitoring observations, files, and reports are maintained on-file with the Natural Resources Team (Eagle Program Manager).

4.9.4.5.1. Population Surveys

APG conducts an annual mid-winter bald eagle count, as part of the nationwide survey effort coordinated through each state. This mid-winter count provides a rough estimate of the local eagle population, including residents and winter migrants. The survey results are only a "snap shot" and are dependent on a number of factors including annual productivity, and local, regional, and broader weather conditions which can trigger earlier or later migrations of northern eagles from Canada and the northeastern U.S. In addition, the survey route is limited to the major shorelines and does not extend inland; therefore, eagles loafing along smaller inland creeks may not be counted.

The mid-winter count is conducted following APG's standardized protocol ("Eagle Monitoring Surveys") which is included in Appendix M. The survey is typically conducted in the first two weeks of January during the survey period designated by the MDDNR. The survey route includes the shorelines and tributaries of APG, and the shorelines of the Susquehanna River north to the Pennsylvania state line. The Susquehanna River is included on the survey, because past satellite telemetry data have indicated that resident eagles of APG regularly utilize the southern portion of the Susquehanna River, especially in the area of the Conowingo Dam just south of the Pennsylvania border.

Results of the survey are provided within seven working days to the MDDNR and the APG eagle working group. Results are reported to the USFWS by 31 August of the same year, as part of annual reporting requirements under the BGEPA permit.

4.9.4.5.2. Productivity Surveys

APG conducts seasonal nest surveys to monitor the productivity of the installation's resident bald eagles. Given ever-increasing fiscal constraints, APG's eagle nest monitoring program has evolved into a cost-efficient effort that maximizes volume of data collection with limited labor and resources. APG's eagle nest monitoring program continues to serve two primary and significant purposes. First, the data indicate that APG can incur higher levels of incidental take while still sustaining a stable, or increasing, nesting population. This line of evidence supported APG's request for an increased take allowance under the new BGEPA permit. Continued data collection may support an even higher take allowance which may be requested as part of the 5-year permit renewal. Second, the productivity data are crucial in order to rule out nest failures as nest disturbances (takes). APG can use its nest monitoring data which are collected throughout the nesting season, to determine whether a nest failure (loss of productivity for a given year) is due to incidental take, unknown, or natural causes. APG has been able to attribute the majority of past nest failures to unknown or natural causes based on the nest monitoring data, and has thereby avoided exceeding the nest take allowance. The USFWS has agreed with APG's nest failure evaluations, because APG has the monitoring data to support accurate evaluations. Without continued monitoring, the USFWS may potentially consider all nest failures as nest takes simply on lack of evidence to suggest the contrary. Consequently, APG could easily exceed its nest take (disturbance) allowance of 3 nests per year.

The nest surveys are conducted following APG's standing operating procedure ("Eagle Monitoring Surveys") which is included in Appendix M. Given the number of nests and the expanse of land to survey on APG, aerial surveys are a labor and cost efficient method to collect productivity data. Additionally, aerial surveys are necessary, because many nests are inaccessible on foot due to risks from unexploded ordnance. The aerial surveys are typically conducted by helicopter in late January, early March, early April, and early May (an additional mid- to late-May survey may be added). Four to five flights per season promote efficiency in the surveys, because the results of each flight are used to guide the next flight. Specifically, the early January flight identifies new or fallen nests; the early March flight identifies early eggs and chicks; the early April flight determines "active" nest status; the early May flight generates initial productivity numbers and chick ages; and an additional mid- to late-May flight confirms fledge dates for many nests that are inaccessible to ground observations. Data collected from the surveys include the condition of each nest, presence of adults in the nest or area, and number of eggs and/or chicks in each nest. All existing and potential nesting areas on the installation are surveyed.

A summary of each survey flight and revised nest map (if applicable) are provided to the APG eagle working group within seven working days. The revised nest map is also posted to APG's SharePoint site. In addition, changes to nest locations and status are provided to APG's GIS Office. Annual productivity is reported to the USFWS by 31 August, as part of annual reporting requirements under the BGEPA permit. An end of year summary of productivity data is also provided to the MDDNR and the APG eagle working group by 31 August.

4.9.4.5.3. Disturbance

APG monitors, as warranted, mission activities and installation operations that have the potential to disturb eagles, particularly nesting eagles. Monitoring of activities and observations from productivity surveys are used together to determine if a nest disturbance has occurred. Summaries of disturbance monitoring include dates and times of observation, type of activity monitored, number of eagles observed, type of eagle behavior observed, minimization measures employed by activity to reduce eagle impacts, and any evidence of disturbance. Areas where a nest disturbance occurred are monitored for the remainder of the nesting season, and the following nesting season, to document any eagle activity at the nest site.

Nest disturbances and associated disturbance monitoring are reported to the USFWS (Form 3-202-15) by 30 September each year, as part of annual reporting requirements under the BGEPA permit. Documented nest disturbances are also reported to the MDDNR and the APG eagle working group as part of the end of year summary of productivity data.

4.9.4.5.4. Injuries/Mortalities

Injured eagles that can be safely captured are transported immediately by APG personnel to Tri-State Bird Rescue (Newark, Delaware) or to an appropriate wildlife veterinarian.

APG investigates each eagle injury and mortality in order to determine if injury/mortality is attributable to incidental take, unknown, or natural causes. The investigations are conducted in accordance with APG's standing operating procedure ("Response to Eagle Injuries and Mortalities") which is included in Appendix M. The standing operating procedure addresses field responses and post-mortem examinations and reflects procedures outlined in the USFWS's Eagle Handling and Distribution Handbook (2016). Information collected during the field response includes photographs, global positioning system coordinates, surrounding habitat characteristics, proximity of electrical and other infrastructure, physical description of eagle, and evidence of trauma. Post-mortem examinations, if warranted, are conducted by the U.S. Army Public Health Center at APG. Information collected during the necropsy includes basic external measurements, external body condition, internal body cavity inspection, estimated time of death, and likely cause of death.

Eagle carcasses and remains are frozen and shipped to the USFWS National Eagle Repository in accordance with APG's standing operating procedure ("Response to Eagle Injuries and Mortalities", Appendix M). The USFWS established the National Eagle Repository in recognition of the cultural significance of eagles to Native Americans. Bald and golden eagles are significant species in Native American culture, and many Native American tribes incorporate eagle feathers or parts in their traditional ceremonies. The National Eagle Repository provides a legal means for Native Americans to acquire eagle feathers and parts.

Any bald eagle found injured or dead on APG is reported to the USFWS within seven days of its capture. Reports are made using the USFWS's on-line Injury and Mortality Reporting (IMR) system. An annual report of injuries and mortalities is downloaded from the IMR and submitted to the USFWS by 31 January of the following year, as part of annual reporting requirements under the BGEPA permit.

4.9.4.5.5. Habitat Conservation

APG documents habitat conservation efforts that benefit bald eagles that are conducted through forest stand improvements and the ACUB program. Summarized information includes location of project site with map, total acreage, description of site, description of eagle habitat and usage, description of on-site conservation activities, and dates of project work. If eligible for conservation benefit, this information will be reported to the USFWS in accordance with the Memorandum of Agreement (to be developed).

4.9.4.5.6. Nest Removal

APG's incidental eagle take permit does not cover intentional nest removals. Authorization for a nest removal may be requested with review and coordination with the USFWS Region 5 Migratory Bird Permit Office. Nest removal authorization will be considered on a case-by-case basis and require an additional or amended BGEPA permit. For one year following the permitted removal of a nest or as required by the BGEPA permit, APG will monitor the area surrounding the affected nest for signs of nest re-building by eagles. The size of the monitoring area depends on the habitat and the proximity of other nest territories, and will be specified in the BGEPA permit. Results of

monitoring will be reported to the USFWS (Form 3-202-16) in accordance with the BGEPA permit.

APG applied for and received a permit to remove an eagle nest in 2018. The targeted nest was a long-established nest built on top of the B645 range tower in the Mulberry Point range area. An inspection report in late 2017 indicated multiple deteriorated conditions of the tower, making the tower structurally unsound. The tower was identified for immediate demolition to alleviate a safety emergency. The tower and nest were ultimately demolished in 2018 (the nest was inactive at the time of demolition).

4.9.5 Nuisance Animals

Prominent nuisance animal species at APG are beavers, Canada geese, mute swans, turkey and black vultures, northern snakeheads, and zebra mussels. These species must be actively managed to minimize their negative impacts on habitats and infrastructure. It should be noted, that other wildlife species (e.g., red fox, coyote, white-tailed deer) can potentially become a nuisance, on an individual basis, if humans intentionally or un-intentionally feed them. In accordance with Maryland state law, APG community members are not allowed to feed wildlife without a permit issued by the MDDNR. The only exceptions are backyard wild bird feeders. However, even bird feeders can attract opportunistic wildlife like foxes, coyotes, and deer looking for an easy meal. The DoO Conservation Law Enforcement Branch enforces "no wildlife feeding" in accordance with Code of Maryland Regulations 08.03.02.05 ("… a person may not…bait or feed wildlife without a use permit…"). The management of nuisance animals on APG is accomplished with collaboration between the Integrated Pest Management Coordinator, the DPW Natural Resources staff, and the DoO Conservation Law Enforcement Branch.

- American Beaver

  The American beaver (*Castor canadensis*) is a native rodent that inhabits many of APG's streams, creeks, rivers, ponds, and marshes. Beavers can quickly alter the habitat of a creek by felling trees and building dams which partially or completely block the flow of water. The resulting flooded areas provide ideal habitat for waterfowl and other wildlife species. However, the obstructed drainage can also result in flooding of low-lying roadways and damage to infrastructure that impedes mission operations.

  
  American beaver

  Beaver dams result in frequent flooding of low-lying roadways in the Westwood area, range areas along Romney Creek, and the perimeter road west of Perryman Test Area. Flooding has the potential to impact critical infrastructure. Beavers are periodically trapped and removed from these areas. However, there needs to be a regular monitoring and trapping program with coordination between the DPW Natural Resources staff, DoO Conservation Law Enforcement Branch, and DPW Roads and Grounds Branch. In addition, select

culverts need to be retrofitted with water leveling devices to allow the co-existence of beavers while avoid flooding of infrastructure.

- Canada Goose

  The Canada goose (*Branta canadensis*) is native to North America and is a commonly sighted bird in Maryland. Flocks of non-migrating (resident) Canada geese have become established throughout Maryland including at APG. Canada geese tend to congregate in large flocks in the open areas of the cantonment where there is unobstructed access to lawn areas and stormwater ponds. The geese can leave excessive droppings on mowed grass areas, sidewalks, and parking lots surrounding buildings. Public health concerns can arise from the accumulations of droppings and feathers on recreation fields and walkways, nutrient loading from droppings in waterways, and aggressive behavior by nesting geese. In addition, the geese can pose a safety hazard when flocks cross roads and interfere with vehicular traffic.

  Effective management of non-migrating geese may require more than one control method. Methods may include habitat modification, exclusion, harassment, chemical repellents, and lethal control. One option that APG utilizes to deter geese from lingering on mowed turf areas is to treat the grass with a chemical repellent. Flight Control Plus is an eco-friendly repellent that results in temporary mild digestive upset for the goose when it eats the grass. The repellent has an ultraviolet marker in the formulation, so the geese see it on the grass and learn by association to avoid the treated area. The repellent needs to be re-applied after each mowing.

  Canada goose
  (Photo by Kevin Bolton)

  Habitat modification and exclusion is an effective option around stormwater ponds. Simply not mowing the grass, or maintaining shrubs at least 10-14 inches high, around the pond reduces the line of sight for the geese. Without a clear line of sight to watch for predators, the geese are less likely to use the pond and surrounding area.

  Trained dogs can also be effective at harassing geese from a property, and is an option that has been used by some tenants in the cantonment area of APG. The dogs are not allowed to catch, injure or kill the geese, but merely chase the geese out of the area. Dogs are not allowed to be used when geese are nesting or unable to fly, such as when goslings are present or during adult feather molt.

- Mute Swan

  The mute swan (Cygnus olor) is a non-native bird that resides year-round in the Chesapeake Bay. Despite their aesthetic appeal, the population of mute swans in Maryland's Chesapeake Bay region has had damaging effects. Mute swans graze heavily on aquatic vegetation, displace native waterfowl species from nesting and foraging sites, and may threaten or directly attack persons who get too close to their nest or young.

  Mute swan
  (Photo by Nicolas Sanchez)

  The mute swan is one of the priority species requiring regional management in the Chesapeake Bay watershed. The Chesapeake 2000 Agreement requires the jurisdictions to develop and implement management plans for this species and other non-native invasive species deemed problematic to the restoration and integrity of the Bay ecosystem. The MDDNR has led efforts across the state to control mute swan populations. The MDDNR management plan states that egg addling and removal of adult mute swans are necessary measures to control the mute swan population. Lethal methods to remove swans are conducted in a humane manner and include shooting, or capture and euthanasia. The MDDNR's plan identified APG as having historically some of the largest numbers of mute swans in the state (MDDNR 2011).

  APG waters continue to harbor some mute swans which hampers the effectiveness of state control efforts to reduce the species population in Maryland. APG management practices to reduce the numbers of mute swans on the installation include addling eggs (which renders the eggs non-viable) and lethal control. Egg addling requires a permit from the MDDNR and should only be attempted by trained personnel. Control methods may either be implemented by APG (DPW Natural Resources staff and DoO Conservation Law Enforcement Branch), or by MDDNR staff with coordination and support from APG.

- Vultures

  There are two species of vultures on APG that can be problematic: the turkey vulture (*Cathartes aura)* and the black vulture *(Coragyps atratus).* Conflicts arise when the vultures congregate in large roosts in residential areas and cause property damage. Black vultures in particular can aggressively tear at window caulking, roof shingles, and rubber trim on cars. Both species have highly acidic stomach liquids and urine which can be destructive to some surfaces. A large congregation of roosting vultures can quickly cover lawns and other surfaces with droppings which can create public health and safety concerns.

APG has utilized two control methods for managing roosting vultures in residential areas. The first method utilizes an artificial vulture "effigy" that is suspended upside down in the roost area. The effigy needs to be hung high enough to be seen from a distance by approaching vultures. Vultures are wary of the effigy and tend to avoid the roost area. A real vulture (dead) can be used as the effigy, but requires a permit from the USFWS.

Turkey vulture (on ground) and black vultures (flying)

A second method utilizes harassment with a low power laser (red or green) from just before sunset to about 30 minutes after sunset. Generally, the vultures respond immediately to the laser and either fly off, or hop to a new perch. As soon as the first few vultures fly off, the others follow. The laser can also be combined with firing of flash-bang shells over the roost tree. All firings are conducted by the DoO Conservation Law Enforcement Branch.

Good housekeeping practices are also critical to deterring vultures, and includes keeping garbage cans and dumpsters closed and removing outside dog and cat food bowls.

- Northern Snakehead

  The northern snakehead (*Channa argus*) is a non-native fish that has become established in some creeks and rivers of APG, the lower Susquehanna River, and other tributaries of the Chesapeake Bay. Although primarily a freshwater fish, the northern snakehead is tolerant of low salinities, very low oxygen, can survive out of water for several days if kept moist, and can lie dormant in mud during droughts. This invasive fish is extremely prolific, and females of the species are capable of releasing 40,000 to 100,000 eggs per spawn, with multiple spawns per year. The northern snakehead is a voracious predator of fishes, crustaceans, and amphibians. Because of its aggressive feeding nature, the northern snakehead has gained in popularity as a sport fishery. The MDDNR established an open season year-round for the species, and anglers are encouraged to catch and kill all snakeheads.

Northern snakehead
(Image by Susan Trammell, USGS)

- Zebra mussel

  The zebra mussel (*Dreissena polymorpha*) is a non-native thumbnail-sized mollusk with a striped shell. The species was originally introduced in the Great Lakes in the 1980s, presumably from ballast water of ships. Zebra mussels are extremely efficient filter feeders that significantly reduce the amount of plankton available to native aquatic life. Massive clumps of zebra mussels can also encrust boat hulls, damage power plant intakes, and disrupt municipal water systems. Since 2009, the MDDNR has reported regular sightings of this invasive mussel in the Susquehanna River downstream of the Conowingo Dam, and more recently, attached to the anchors of the navigational and hazard buoys that are placed throughout the Upper Chesapeake Bay. Zebra mussels have not yet been discovered in APG waters; however, the species continues to be sighted in waters adjacent to APG. Therefore, there is the potential that the mussel may already exist on APG.

Zebra mussels

4.9.6 Management Strategies and Actions

<u>Strategy</u>: Manage the size of the white-tailed deer herd for a healthy carrying capacity

- <u>Action</u>: Conduct annual deer harvest analysis
- <u>Action</u>: Conduct spotlight counts to estimate deer population
- <u>Action</u>: Conduct overflight with FLIR system and video to estimate deer population
- <u>Action</u>: Conduct special antlerless deer hunts as necessary

<u>Strategy</u>: Survey other wildlife populations to estimate populations and determine healthy carrying capacities

- <u>Action</u>: Conduct survey of coyote population
- <u>Action</u>: Conduct annual wild turkey harvest analysis
- <u>Action</u>: Conduct surveys of small game species populations

<u>Strategy</u>: Implement ecosystem-based fisheries management

- <u>Action</u>: Conduct fishery planning level survey
- <u>Action</u>: Establish regular maintenance schedule for Van Bibber fish ladder

- Action: Coordinate with federal, state, local, private, and academic organizations on fisheries issues

Strategy: Conserve migratory bird populations in harmony with military missions

- Action: Refine list of priority bird species for conservation management based on species currently known to occur on APG
- Action: Design and conduct survey for FIDS
- Action: Design and conduct survey for grassland nesting birds in support of implementing a reduced mowing schedule in select fields
- Action: Install and monitor osprey nest platforms to encourage nesting away from power poles
- Action: Install and monitor barn owl nest boxes to encourage nesting away from mission infrastructure
- Action: Install and monitor wood duck boxes
- Action: Install and monitor bluebird boxes
- Action: Install fishing line receptacles at fishing piers
- Action: Provide public outreach/awareness on threats of feral cats on birds

Strategy: Sustain mission activities and installation operations while minimizing bald eagle takes

- Action: Implement protective nest buffers, implement avoidance and minimization measures, and adaptively manage eagle use areas (nests, roosts, shoreline foraging areas)
- Action: Conduct annual inspections and replacements (as needed) of avian deterrents and protective devices on electrical infrastructure
- Action: Bury existing overhead power lines where feasible and as funds allow, to reduce potential of eagle takes due to line strikes
- Action: Evaluate all new proposed power lines/configurations for burial feasibility; install appropriate deterrents and protective devices if burial is not feasible; refer to Avian Power Line Interaction Committee standards (APLIC 2006, 2012) for avian-safe line configurations

Strategy: Monitor bald eagles using standardized protocols for analysis of long-term trends

- Action: Conduct annual mid-winter population count

- Action: Conduct seasonal nest productivity surveys

- Action: Conduct field responses and investigations of all eagle injuries and mortalities

- Action: Conduct disturbance monitoring for shoreline training exercises and other specific activities and operations, as warranted

- Action: In coordination with USFWS, develop and implement a standard carcass monitoring protocol for quantifying incidental carcass searches and conducting one-time searcher efficiency and carcass persistence trials; data to be used by USFWS in support of APG's incidental take permit

Strategy: Sustain mission landscape and conserve habitat

- Action: Coordinate with APG forest management program to identify forest stands for habitat improvement to benefit bald eagles and promote ecosystem-level benefits without encumbering mission space

- Action: Coordinate with APG ACUB program to identify eagle use areas on potential parcels for habitat conservation

- Action: Develop Memorandum of Agreement with USFWS for eagle conservation credit from habitat conservation efforts (forest stand improvements and ACUB program)

Strategy: Ensure personnel awareness

- Action: Provide eagle awareness training to work force through on-line and/or face-to-face instruction

- Action: Provide eagle awareness to installation community through signage, news articles, pamphlets, other notifications, etc.

Strategy: Actively manage nuisance animal species to reduce their impact on habitats and infrastructure

- Action: Formalize procedures with DPW Natural Resources staff, DoO Conservation Law Enforcement Branch, and DPW Integrated Pest Manager for nuisance beaver trapping

- Action: Conduct evaluation of options to retrofit culverts with debris barriers which allow flow of water in drainages frequently impacted by beavers and easier removal of debris if accumulated

- Action: Coordinate with MDDNR to reduce population of mute swans on APG

- Action: Conduct annual spring and/or summer aerial survey for mute swans, preferable concurrent with MDDNR survey
- Action: Continue to engage tenants on recommendations for abating Canada geese
- Action: Provide public awareness brochure to recreational anglers and boaters regarding zebra mussels

4.10 WILDLIFE AIRCRAFT STRIKE HAZARD MANAGEMENT

4.10.1 Background

The purpose of wildlife aircraft strike hazard management (WASH) is to minimize the risk of strikes to fixed and rotary winged aircraft by wildlife on and around airfields. APG's two airfields (PAAF and WAH) each independently implement their own WASH program; PAAF is managed by ATC and WAH is managed by the MDARNG. According to Army guidance (IMCOM Pamphlet 385-90-1), an effective WASH program should engage not only the tenant airfield personnel but also Garrison support personnel, including the DPW Natural Resources staff. The DPW Natural Resources staff is currently working with both airfields to take a more active support role in the airfields' WASH programs.

As the WAH is used solely for rotary winged aircraft, wildlife strikes are rare at this airfield. However, steps can still be taken to ensure that habitat surrounding the airfield continues to discourage wildlife interactions. The DPW natural resources staff is currently assisting the MDARNG with a wildlife hazard assessment which will provide a foundation for developing a more rigorous WASH plan for WAH. Preliminary site visits indicate that white-tailed deer, groundhogs, gulls, and Canada geese are the primary wildlife hazards.

The PAAF is used for both rotary winged and fixed wing aircraft, with fixed wing flights becoming more frequent in the past 3 to 5 years. Strikes from birds are rare at PAAF, though there is the potential for increased risk if habitat on and around the airfield is not proactively managed. Eagles are frequently sighted on the runway, in the trees south of the main runway, or flying overhead. In 2013, an eagle collided with a fixed wing aircraft; this is the first and only documented eagle aircraft strike at APG. White-tailed deer are also a hazard at the PAAF. There is currently no perimeter fence around the airfield. Airfield personnel haze deer that are on or close to the runway by driving an airfield truck down the runway prior to flight operations each day.

4.10.2 Management Strategies and Actions

Strategy: Reduce potential for wildlife aircraft strike hazard

- Action: Complete wildlife hazard assessment for WAH and assist with updating WASH plan
- Action: Coordinate with PAAF personnel on developing more supportive role for DPW Natural Resources staff in WASH program

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4.11 OUTDOOR RECREATION

The purpose of APG's Outdoor Recreation Program is to provide outdoor recreational opportunities to active and retired military personnel, civilian workers, and the public within the constraints of the military mission and the capability of the natural resources, while protecting and preserving the resources for future generations. For the purposes of this INRMP, outdoor recreation is defined as recreational programs, activities, and opportunities that depend on the natural environment (e.g., hunting, trapping, fishing, crabbing, picnicking, etc.). Developed or constructed facilities and activities, such as tennis courts, baseball facilities, etc., are DFMWR management responsibilities and are not addressed in this INRMP.

Providing for quality outdoor recreational opportunities is a collaborative effort between the DFMWR, DoO, DPW, Installation Safety Office, and Range Control. The DFMWR's Recreation Division administers the Outdoor Recreation Program and is responsible for APG's Outdoor Recreation Plan (Appendix N). The DoO Conservation Law Enforcement Branch enforces the federal and state laws and installation regulations pertaining to natural and cultural resources. The DPW Natural Resources staff guides the ecosystem-based management of the installation's natural resources, including public access for enjoyment of these resources. The Installation Safety Office provides guidance on mitigating human safety risks related to hunting, trapping, fishing, and crabbing. Range Control oversees access into restricted areas.

4.11.1 Access and Restrictions

As stated in DoDI 4715.03, "DoD lands, waters, and coastal resources shall be made available to the public for the educational or recreational use of natural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness." At APG, public access to most of the installation is prohibited because of safety and security issues related to unexploded ordnance, hazardous materials, and weapons testing. Public access limitations and restrictions are put into place to ensure adequate access to APG's natural resources, while ensuring public safety and not compromising the military mission. Generally, cantonment areas are open for outdoor recreation, in addition to select restricted areas based on mission operations.

APG has exclusive jurisdiction over its waters, and public access to APG waters is restricted, and at times closed based on mission operations. All tributaries, creeks, and shorelines within the installation boundaries, with the exception of Lauderick Creek, are closed to the public at all times. The remaining restricted waters are normally open for public use (fishing, navigation, anchoring, and water skiing) during the following hours: 1) Monday through Thursday, 5 pm to 7:30 am, 2) weekends, 5 pm Friday to 7:30 am Monday, and 3) Federal holidays, 5 pm the day preceding the holiday to 7:30 am the day following the holiday. The DoO Conservation Law Enforcement Officers regularly patrol APG's waters in addition to Range Control patrol boats during mission operations. Buoys mark the boundaries of the restricted water areas. Entrance into the restricted waters for navigational purposes during periods of mission operations may be permitted if an entrance clearance can be secured by contacting an APG patrol boat personally or

via VHF marine channel 68. Range Operations may also be contacted by phone (410-278-3971/2256). "Restricted Area-Keep Out" buoys mark additional areas within the restricted waters that are off limits to the public due to safety concerns. These smaller buoys are normally in place from March to November.

Swimming, scuba diving, and other activities in which people are outside of a vessel (except water skiing) are prohibited at all times in APG waters. Additionally, due to UXO and other unseen hazards, boaters are restricted from touching land, docking, or grounding a vessel on either dry or subaqueous land.

4.11.2 Regulations, Permits, and Fees

All hunting, trapping, fishing, and crabbing on APG is conducted in compliance with federal, state, and APG regulations. APG has three regulations addressing hunting, trapping, fishing, and crabbing, and these regulations are available from DFMWR and from the Installation Management Community SharePoint Portal (https://army.deps.mil/army/cmds/imcom_usag5/aberdeen/SitePages/Home.aspx):

- APGR 200-6, Recreational Hunting and Trapping
- APGR 210-10, Use and Navigation of Restricted Waters and Control of Commercial Fishing and Crabbing
- APGR 210-26, Recreational (Non-Commercial) Fishing Rules

Patron eligibility criteria follow guidance in AR 215-1 and APG regulations. Hunters, trappers, anglers, and crabbers are required to have proper MDDNR licenses, stamps, and permits. In addition, appropriate APG permits are required:

- APG hunting/trapping permit is required by all hunters and trappers
- APG recreational fishing/crabbing permit (and security badge) is required by recreational anglers/crabbers in the restricted areas
- APG commercial fishing/crabbing permit is required by all commercial anglers/crabbers

Permits are sold through APG's iSportsman website. The site is managed by the DPW Natural Resources staff. The same fee schedule is used for all eligible patrons, with discounted exceptions to senior citizens and disabled persons, youths, and non-hunting observers.

In accordance with the Sikes Act, permit fees collected from the sale of hunting/trapping and fishing/crabbing permits are deposited into the Army Fish and Wildlife Conservation fund (21X5095) for APG. These 21X funds are utilized for the protection, conservation and management of fish and wildlife on APG, including habitat improvement and related conservation activities and costs described in this INRMP.

4.11.3 Hunting

Safety is the first concern of the APG hunting program. Due to historic testing and training activities at APG, encountering unexploded ordnance (UXO) is a possibility.

The instructional part of the hunter safety program consists of a range safety briefing which includes a UXO identification video. The Installation Safety Office in coordination with Range Control provides a recommendation to the Garrison Commander on the safety of APG areas for hunting. The Installation Safety Office, along with Range Control and units stationed at APG with UXO expertise, conduct visual UXO sweeps of hunting areas on a recurring basis. The results of these visual observations provide the basis the Installation Safety Office uses in its recommendation to the Garrison Commander on the safety of the hunting program. VENQ funds are not used in the UXO visual sweeps.

Hunting seasons on APG include upland game (shotgun), migratory birds (shotgun), wild turkeys (shotgun and archery), white-tailed deer (shotgun, muzzleloader, and archery) and groundhogs (archery). All hunters at APG are required to hunt with at least one other person. Under no circumstance will hunters be in the field alone. In addition, there is at least one person who has a Hunter-In-Charge (HIC) status in each hunting party.

Specific training is required for the HIC to ensure safety for all participants. APG's hunting program is open to all patrons who meet eligibility requirements. Every eligible hunter has the opportunity to be trained as a HIC. There is no unfair advantage or greater opportunities for HICs. APG's Garrison Commander has endorsed and approved the HIC program as a necessary component of the hunting program to ensure safety for all participants.

Cantonment areas and select restricted areas are open to hunting. HICs escort their hunting party out to their designated areas and are responsible for their control for the duration of the hunt. Specific areas of the installation may be requested, but they are granted only if available for that day. All requests for hunting areas are made through the iSportsman system. Because of UXO concerns, hunters are restricted to a marked firing point during gun hunting season and to a 50-yard arc of movement from their assigned shotgun and muzzleloader hunting areas. Hunting areas are designated by signs and natural features to help hunters remain in their assigned areas. The DoO Conservation Law Enforcement Officers regularly patrol the hunting areas to ensure that hunters stay within their assigned hunting areas.

Openings and closings of hunting areas are dependent on mission operations; areas are opened or closed by Range Control based on the testing scheduled for that particular day. The DPW Natural Resources staff may also request that areas be seasonally closed to hunting, or areas re-marked for hunting, based on proximity to bald eagle nests and roosts.

4.11.4 Trapping

Trapping is done for a variety of purposes including food, fur trade, wildlife management, and nuisance animal control. The following species are managed as "furbearers" in Maryland and can be found at APG: beaver, coyote, mink, muskrat, opossum, raccoon, red fox, river otter, and skunk. Trapping requires a time and effort

commitment by participants as traps need to be checked at least once a day. Recreational trapping at APG is conducted in designated areas which are opened for three months at a time by Range Control. Areas are assigned to interested trappers by a hand draw conducted by Conservation Law Enforcement. Those recreational trappers who have completed the Maryland Wildlife Damage Control Operators course may be temporarily assigned to areas where beavers are impacting installation infrastructure. With the lack of a robust trapping program, beavers are flourishing on APG and their dams result in frequent flooding of low-lying roadways which threaten critical infrastructure.

4.11.5 Fishing and Crabbing

Recreational fishing and crabbing, whether from boats or shorelines, are popular outdoor activities at APG. The principal sport fish are largemouth bass, smallmouth bass, striped bass, pumpkinseed, bluegill, yellow perch, white perch, crappie, catfish, and common carp. Fishing and crabbing from the shoreline is allowed in several designated areas of the cantonment:

- Swan Creek – easterly from installation perimeter to Building 2403
- Spesutie Island Marina – 100 feet from launch ramp, easterly to restricted area
- Woodpecker Point – causeway to Dipper Creek
- Spesutie Island – west shore from causeway to 200 meters south
- Gunpowder River – east shore from northern installation boundary to restricted area
- Lauderick Creek – southerly from Skippers Point to restricted area

Fishing is not allowed from boat storage piers and adjacent to boat launch ramps.

Commercial fishing and crabbing (also including eel and turtle) is allowed in designated areas of APG's waters. All holders of APG commercial fishing permits are required to report their monthly catch to the installation.

4.11.6 Other Outdoor Recreation

Other outdoor recreational activities promoted on APG include camping (tents and recreational vehicles), picnicking, boating (including canoeing and kayaking), and skeet and trap shooting. More information on these activities, facilities, and rental equipment are available from the DFMWR Outdoor Recreation office. Off-road all-terrain vehicles for recreational use are prohibited on APG. Boat slips and storage are available in both the Edgewood and Aberdeen Areas.

A Watchable Wildlife program is currently not available at APG due to safety concerns for UXO and/or security issues. However, the DPW Natural Resources staff engages the public through newspaper articles and outreach events to educate and offer guidance on enjoying wildlife and the outdoors. Patrons are always reminded to

observe wildlife from a respectable distance and to not feed, touch, pick up, or move any animal.

4.11.7 Disabled Access Opportunities

In accordance with Section 670c of the Sikes Act, the Army shall ensure, to the extent reasonably practicable, that outdoor recreation opportunities made available to the public also provide access for disabled veterans, military dependents with disabilities, and other persons with disabilities.

At APG, disabled access opportunities are accommodated by DFMWR upon receipt of the request. Past requests have included opportunities to hunt from a vehicle.

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4.12 CONSERVATION LAW ENFORCEMENT

4.12.1 Authority, Jurisdiction, and Responsibilities

DoDI 5525.17 authorizes the Conservation Law Enforcement program with specific policies, responsibilities, and directions for the program. The primary objective of Conservation Law Enforcement is the enforcement of federal and state laws and regulations pertaining to the protection of the environment and the natural and cultural resources on the installation. Effective enforcement of conservation laws and regulations enhances the success of natural resource programs, protects the natural and cultural resources of the installation, and ensures public safety. The successful implementation of this INRMP is very much dependent on APG's dedicated and trained staff of Conservation Law Enforcement Officers. To that end, Conservation Law Enforcement Officers must be afforded their full authority and powers as directed by DoDI 5525.17 and be made available to support and enforce natural resources management actions. It is far more logistically and fiscally sound to have fully enabled Conservation Law Enforcement Officers, as opposed to outside agencies, for assisting with projects such as nuisance animal control.

APG has exclusive federal jurisdiction over the entire installation. No jurisdictional authority is afforded to outside enforcement agencies. Therefore, APG's Conservation Law Enforcement Branch is responsible for conservation enforcement activities on over 32,000 acres of open water and close to 40,000 acres of land. As stated in DoDI 5525.17, a sufficient number of natural resources law enforcement personnel must be available and assigned responsibility to perform tasks necessary to carry out the installation's Conservation Law Enforcement program. APG's Conservation Law Enforcement Officers are equipped with modern enforcement tools including weapons, mobile radios, FLIR scopes, 4-wheel drive vehicles, all-terrain vehicles, and patrol boats.

APG's Conservation Law Enforcement Officers are responsible for multiple tasks associated with the enforcement of conservation laws including:

- Patrolling hunting areas to ensure hunters safely stay within their assigned areas; assisting lost hunters; tracking of injured game animals outside of their assigned areas; and enforcement of safety regulations regarding hunting and trapping
- Patrolling open waters to enforce boating safety, catch limits, and encroachment into restricted waters
- Engaging with public, installation residents, and workers through formal outreach events or field encounters to promote conservation awareness
- Reporting and tracking natural and cultural resources crimes and their disposition (both military and civil)
- Providing specialized or technical expertise to DPW Natural Resources staff in implementation of natural resources actions

- Assisting with nuisance wildlife management efforts to include harassing, trapping, and/or lethal control means as warranted and supported by DPW Natural Resources staff and in accordance with Maryland state permits
- Humane dispatching of injured or sick wildlife in accordance with conservation laws and regulations
- Environmental sampling in accordance with conservation laws and regulations when requested by DPW Natural Resources staff
- Providing all weather search and rescue capability on land and water
- Patrolling remote and outlying areas to detect/prevent poaching, criminal trespassing for illicit purposes, illegal dumping, or other environmental crimes

Conservation Law Enforcement Officers work closely with Natural (and Cultural) Resources staff. With regards to natural resource management actions, the Conservation Law Enforcement Officers are uniquely qualified and resourced to assist the DPW Natural Resources staff. The Officers have an in-depth knowledge of the installation lands and waters and mission activities, have the means to access remote areas (via all-terrain vehicles or boats), and are weapons qualified. This combination of capabilities makes the Officers indispensable for carrying out or assisting with a variety of natural resources actions. The Officers are authorized (DoDI 4715.03) to coordinate with appropriate agencies to support enforcement of Federal and applicable State laws and regulations pertaining to the management and use of the natural resources under their jurisdiction. Under this authority, the Conservation Law Enforcement Branch can engage the MDDNR on collaborative natural resources efforts, like mute swan control.

APG's Conservation Law Enforcement Branch falls under the Police Services Division of DoO. There are recurring discussions within DoO to make the Conservation Law Enforcement Officers dual-function, that is, available to back-fill police law enforcement as needs arise. It is imperative to the success of this INRMP that APG maintain their Conservation Law Enforcement Officers as 100% conservation-focused enforcement officers.

4.12.2 Training

The primary (basic) training for personnel who serve as Conservation Law Enforcement Officers is the Federal Law Enforcement Training Center (FLETC) Land Management Police Training (LMPT) Program. Any equivalent basic natural resources management training must meet the standards of the natural resources management program of instruction of FLETC LMPT. Currently, the Department of the Army has contracted the development of an equivalent Conservation Law Enforcement training program to meet requirements under DoDI 5525.17, to be completed in addition to the basic Department of the Army Civilian Police training for personnel assigned to Conservation Law Enforcement duties. Conservation Law Enforcement Officers may complete additional training such as basic and advanced marine operations, archeological and cultural resources protection, environmental crimes investigations, hazardous materials awareness and operations, waterfowl identification, natural resources compliance or specialized courses as available, and any additional training to enhance capabilities to

support the INRMP. After the initial FLETC LMPT training or equivalent training, a minimum of 40 hours of refresher training is required annually in addition to the minimum training required under AR 190-56. Weapons training is conducted at least twice annually as required by regulation and may include offensive, defensive, and specialized weapons.

4.12.3 Management Strategies and Actions

Strategy: Ensure Conservation Law Enforcement Officers are afforded their full authority and powers as directed by DoDI 5525.17

- Action: Develop Conservation Law Enforcement Plan and integrate into INRMP

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4.13 GIS MANAGEMENT

A GIS is a system of hardware, software, and procedures designed to support the capture, management, manipulation, analysis, modeling, and display of geospatial information. It is the ability of GIS to display large amounts of geospatial information in a graphical manner that makes it an important technology to support installation management programs. APG uses GIS for integrated planning, command and control (NEPA analysis, relocation and move management, space management, noise management, site selection, permitting, and environmental management), operations and management, emergency management and operations (fire, police, medical), emergency preparedness planning, analysis and mapping support, communications and briefing support, excavation permitting, military training, land navigation training, daily maintenance of infrastructure, as well as integration with business (tabular data) systems. The GIS management program falls under the DPW Master Planning Division, and is managed and operated by civilian and contractor GIS professionals.

The GIS was migrated to Spatial Data Standard (SDS) 3.1 in January 2015. Although there are still GIS layers being added, there are currently 199 layers that are kept to SDS version 3.1 standard and uploaded to OACSIM GIS Data Repository on a quarterly basis in accordance with AR 115-13. Due to the migration, a number of features were dropped from the SDS. Those features that are still used by APG personnel (Maryland critical areas, FIDS, etc.) are kept for local use and updated on an as needed basis. APG is scheduled to migrate its GIS data to the new SDS version 4.0 in FY20. Similar issues could arise and will be handled in a similar manner.

The GIS software is ArcGIS 10.0 linked to an Oracle 11g RDBMS through ArcSDE. There is a request submitted to IMCOM for an upgrade to ArcGIS 10.3. The Microstation V8i version of the GIS features is exported from ArcGIS on a regular basis for use by DPW engineers and contractors using CADD.

The GIS is an integral part of natural resources management providing mapping of various data layers. The GIS is particularly useful in identifying and tracking environmental constraints and opportunities. The following layers are of particular use to natural resource programs:

- Aerial imagery (1952-2015)
- Ranges and berms
- Buildings
- Coastal zone
- Bird habitats
- SAV
- Forests
- Soil type
- Flood zone
- Streams and water bodies
- Boundaries
- Roads
- Land use
- Special management areas
- Threatened and endangered species habitats
- Wetlands
- Grasslands
- Elevation models
- Shorelines

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4.14 LEASES

4.14.1 Agricultural and Grazing Leases

4.14.1.1 Background

The Army's reimbursable agricultural and grazing outlease program supports efficient land management and the military mission. The outlease program allows installations to use proceeds from outleases to cover expenses associated with ecosystem-based land management and lease administration. The primary goals of the Army's agricultural and grazing outlease program are to maintain Army land to support mission and ecological requirements, reduce maintenance and custody costs, and provide access to additional agriculture and grazing lands to local communities.

There is currently no grazing outlease program implemented at APG, and none is planned or anticipated for the future. However, APG could benefit by establishing an agricultural outlease program for hay fields. The Edgewood Cantonment area has several infrequently mowed grass fields which could be converted for agricultural outleases as hay fields. This proposed outlease program would reduce the installation's mowing costs for maintaining these fields and promote multiple-use of Army lands.

4.14.1.2 Management Strategies and Recommended Actions

Strategy: Establish agricultural outlease program compatible with military mission

- Action: Coordinate with DPW Roads and Grounds to select some fields for agricultural outleasing in Edgewood Cantonment

4.14.2 EUL Leases

4.14.2.1 Background

EUL is a method for leasing under-utilized military property to a private developer who pays rent in the form of cash or in-kind services. An effective EUL program reduces the Army's operation and maintenance requirement, attracts tenants who are synergistic with the missions of the installation, and provides cash or in-kind funding source for needed and unfunded installation projects.

APG created an EUL property (The GATE) north of Maryland Boulevard near the Maryland Boulevard installation entrance gate in the Aberdeen Area. This EUL development plan consists of 415 acres to include research and development, administrative, warehouse, flex, and retail space. The Master Lease with the developer (St. John Properties, Inc.) is for a term of 50 years with a 25 year additional option. Property development in the EUL will occur in 12 phases (Land Bays A through L, with each land bay to include 2 to 9 buildings). Phases of development are expected to include research and development space, flex space, single- and multi-story office

space, and retail space (mail, dry cleaner, bank). Full build out is dependent on demand for space.

The APG Master Plan has designated additional areas for potential EULs including the warehouse area in the western portion of the Edgewood Cantonment area, bordering the Westwood area.

In accordance with DoDM 4715.03, an installation INRMP addresses natural resources management on all installation property, including leased lands. It is important that best management practices for natural resources management are reflected on EUL properties, both during and after construction. Inclusion of a provision in future EULs requiring the lessee to perform natural resources conservation duties as a condition of occupancy or use of the parcel may be considered.

5. IMPLEMENTATION

An INRMP is considered to be effectively implemented if the installation:

1. Actively requests, receives, and uses funds for natural resources management projects, activities, and other requirements in support of goals and objectives identified in the INRMP,

2. Ensures that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP,

3. Invites annual feedback from appropriate USFWS and State fish and wildlife agency offices on the effectiveness of its INRMP,

4. Documents specific INRMP action accomplishments undertaken each year, and

5. Evaluates effectiveness of past and current management activities and adapts those activities as needed to implement future actions.

5.1 PROJECT LIST

The purpose of the project list is to guide natural resources management activities over the next five years, to identify recurring and non-recurring activities, and to help justify annual funding requests to IMCOM. This project list will be reviewed annually as part of the annual INRMP review. Executed projects will be judged as to their degree of success in ecosystem benefit and mission sustainment. Successful projects will be retained and refined, as necessary. Projects judged not to be beneficial or contributing to an overall natural resources management objective will be analyzed as to the reasons for their lack of success, and either modified or dropped. Projects which have been found to be beneficial and contributing to mission sustainment will be continued and monitored, so that refinements can be made when required to adapt to changing conditions. The project list will contain both specific management activities (e.g., planning level surveys) and also broad-scale ecosystem projects (e.g., mitigation banks, etc.). The project list is included in Appendix O.

5.2 FUNDING AND EXECUTION STRATEGIES

The goals of this INRMP must be addressed with increasingly limited resources, namely manpower and funding. With increasing fiscal constraints and reductions in DoD budgets, it is becoming more difficult to execute natural resources projects, even though non-action may have long-term ecosystem side effects, unless the projects are clearly linked to an enforceable compliance issue or can be shown to save the Army money. Natural resources managers must pursue multiple vehicles for funding and executing projects including not only standard lines of funding, but also opportunities for partnerships with entities outside the Army. Additionally, natural resources managers need to plan for projects a number of years into the future as reflected in the Program

Objective Memorandum (POM). A POM is a 5-year outlook and recommendation from the Military Services and Defense Agencies to the Secretary of Defense concerning how they plan to allocate resources for programs to meet the Service Program Guidance and Defense Planning Guidance.

5.2.1 Operations and Maintenance Army (OMA) Funds

The natural resources program at APG is primarily funded from appropriated funds, specifically Operations and Maintenance, Management Decision Package (MDEP) Environmental Quality Funding (VENQ). The programing for funds, 3 to 7 years out, is conducted at the IMCOM and HQDA level. For budget execution, IMCOM uses a cost model, Environmental Quality (formally known as BRM-EQ), to develop installation level recurring environmental requirements such as salaries, compliance driven requirements, permits, etc. Non-recurring environmental requirements (one-time requirements) as well as items not yet included in the model are reported annually through the Garrison Environmental Requirements Build (GERB) database that is validated and approved in coordination with U.S. Army Environmental Command and IMCOM G4. Approximately 90 percent of available funding is used to fund the majority of modeled requirements. Most conservation projects compete against compliance and pollution prevention projects for the remaining 10 percent of available funding. A great deal of confusion exists concerning environmental funding of new or unpredictable requirements, or how installations will communicate new or adjusted requirements to HQDA.

The facilities programs at APG are funded by Sustainment, Restoration and Modernization (SRM) funds, specifically QRPA – Real Property Maintenance (Sustainment) and ERVT Modernization (Restoration and Modernization). Sustainment funds the maintenance and repair activities necessary to keep a typical inventory of facilities in good working order over their expected lives. Restoration funding is used to restore failed or failing facilities, systems, and components damaged by a lack of sustainment, excessive age, fire, storm, flood, freeze, or other natural occurrences. Modernization funding adapts facilities to meet new standards and includes the erection, installation, or assembly of a new real property facility, the addition, expansion, extension, alteration, conversion, or complete replacement of an existing real property facility.

Additionally, Real Property Services funding (QDPW) provides for those activities of an installation support nature. It includes those support elements and services identified as indirect overhead by HQDA and grounds maintenance activities.

While SRM and QDPW funds are primarily focused on the built infrastructure, funding guidance does allow funds to be spent on specific projects that indirectly support conservation programs. Some examples include repairing water control structures to support migratory waterbirds, maintaining native landscapes, and retrofitting stormwater BMPs.

5.2.2 Conservation Reimbursable Funds

The Conservation Reimbursable and Fee Collection Program consists of three individual and distinct program areas: Forestry, Agricultural/Grazing Out-Leases, and Fish and Wildlife. While these programs support military readiness and land management objectives, revenues from these programs supplement base operations and other funding.

5.2.2.1 Forestry

Forestry funds are generated from the sale of forest products on military lands and are centrally controlled by HQDA. Installations submit funding requests annually via the Reimbursable Program Tracking System. While the program is focused on commercial forestry operations, APG has successfully competed for funds. Forestry funds must be used only for projects directly related to forest ecosystem management. Such projects include timber management, reforestation, timber stand improvement, inventories, fire protection, construction and maintenance of timber area access roads, purchase of forestry equipment, disease and insect control, planning, marking, inspections, sales preparations, personnel training, and sales. APG is seeking contractual authority to conduct installation level timber sales enabling APG to deposit funds in the account.

5.2.2.2 Agriculture/Grazing Out-Leases

Revenues generated from Agriculture/Grazing Out-Leases are centrally controlled by HQDA. Installations submit funding requests annually via the Reimbursable Program Tracking System. Proceeds are allocated to the installations and USACE districts based on the Agricultural/Grazing Out-Lease protocol. Revenue may be used for administration and operational expenses of agricultural leases; initiation, improvement, and perpetuation of agricultural leases; preparation, revision, and requirements of integrated natural resources management plans; and implementation of integrated natural resources management plans. APG is working to establish a hay out-lease.

5.2.2.3 Fish and Wildlife (21X5095)

Fish and wildlife funds are collected through sales of permits for hunting and fishing on military controlled lands (less up to ten percent for administration costs) and are deposited into the Army Fish and Wildlife Conservation fund (21X5095). These funds may be used only for fish and wildlife management on the installation where they are collected. They cannot be used for recreational activities. They are exempt from equipment purchase amount limitations, and they do not expire (un-obligated funds carry over on October 1). APG accrues approximately $70,000 annually from the sale of recreational hunting and fishing permits.

5.2.2.4 DoD Forestry Reserve Account

DoD Forestry Reserve Account funds are awarded to projects on a competitive basis, and are primarily used to benefit forest resources. Funds result from the sale of forest products from military installations, with approximately $1-2M per year awarded across the Military Services. APG has successfully competed for funds for small forestry projects.

5.2.3 Mission Funds

Research, Development, Test, and Evaluation (RDT&E) funding is available to some tenants and is used to pay the operating costs of dedicated activities engaged in the conduct of research, development, and test and evaluation efforts. RDT&E funds can be used to repair and maintain testing lands. For example, at the Perryman Test Area and the Churchville Test Area, RDT&E funds pay to maintain the test track surfaces.

5.2.4 ITAM Funds

ITAM funding enables the Army mission by funding rehabilitation and maintenance of training lands to sustain and enhance the capability to meet long-term doctrinal requirements. The program is managed by HQDA G3 using funding from MDEP TATM. Funding requirements over the POM are generated by a model based heavily on maneuver, not testing or regulatory statute.

Installations identify and prioritize ITAM projects and funding requirements on an annual basis. These requirements are systematically validated at higher levels. At APG, requirements are compiled by ATC and are validated by U.S. Army Test and Evaluation Command, Army Training Support Center, and then HQDA G3. Funding is distributed through U.S. Army Test and Evaluation Command who in-turn fund specific installation-level projects.

APG, although having received limited funding in the past, does not compete well for ITAM funds. The overall ITAM program budget was severely reduced in 2007 and is focused on maneuver installations. However, APG has received limited funding for projects such as aerial spraying of common reed (*Phagmites australis*), construction of the boat ramp at ATC's Amphibious Landing, and clearing lines of sight. Most projects to implement this INRMP will not qualify for ITAM funding.

5.2.5 Other DoD Funding Sources

5.2.5.1 Legacy Resource Management Program

The Legacy Resource Management Program assists DoD in protecting and enhancing natural and cultural resources while supporting military readiness. A Legacy project may involve habitat conservation management efforts, species at-risk and species of concern, readiness and range sustainment, regional ecosystem management initiatives, economics of historic preservation, invasive species control, and predicting migratory patterns of birds and animals.

A Legacy project must meet the following three criteria: 1) must have regional or DoD-wide significance; 2) must support military operations or legal statutory requirements that go beyond installation-specific needs; and 3) must emphasize cross-cutting conservation efforts that support or leverage ongoing or new DoD initiatives, demonstrate cost efficiencies and time savings, or exhibit new and innovative ways of conducting resource conservation on DoD lands. While APG will continue to seek Legacy funding, it is not expected to be a viable funding source for implementing this INRMP.

5.2.5.2 Environmental Security Technology Certification Program

The goal of the Environmental Security Technology Certification Program (ESTCP) is to demonstrate and validate promising, innovative technologies that target the most urgent environmental needs of the DoD. These technologies provide a return on investment through cost savings and improved efficiency. Innovative technology offers the opportunity to reduce costs and environmental risks. ESTCP offers funding in the following five focus areas: Energy and Water; Environmental Restoration; Munitions Response; Resource Conservation and Climate Change; and Weapon Systems and Platforms. While ESTCP will not fund installation specific projects, APG does benefit from the resulting technologies. For example, APG is currently serving as a demonstration installation for an ESTCP project which will demonstrate and evaluate a simplified approach to determine optimal hydrologic modeling for a given area.

5.2.5.3 Strategic Environmental Research and Development Program

The Strategic Environmental Research and Development Program (SERDP) is the DoD's environmental science and technology program in partnership with the U.S. Department of Energy and USEPA. SERDP addresses the highest priority issues confronting the Military Services. This program focuses on applying innovative technologies and approaches to support long-term sustainability of DoD's testing and training ranges while working to significantly reduce current and future environmental liabilities. SERDP has the same five focus areas as ESTCP. As with ESTCP, APG has benefited from results of the SERDP program.

5.2.5.4 REPI Program

The REPI Program protects military missions by helping remove or avoid land-use conflicts near installations and addressing regulatory restrictions that inhibit military activities. Through the REPI program, the DoD funds cost-sharing partnerships among the Military Departments, private conservation groups, and state and local governments to acquire easements or other interests in land from willing sellers to preserve compatible land uses and natural habitats near installations and ranges that help sustain critical, at-risk military mission capabilities.

There are two types of DoD funding for REPI buffer partnerships: 1) Service (Army) funds and 2) REPI program funds that are identified by Congress in a line-item in the DoD budget. The process for competing for REPI funds is lengthy. Generally, projects are identified at the installation level and a proposal is developed in cooperation with partners. This proposal is reviewed by HQDA and forwarded to the Office of the Assistant Chief of Staff for Installation Management for approval and possible submission to DoD to compete for REPI funds. Upon approval, REPI funds are obligated to the cooperative agreement and the partner may begin withdrawing funds to secure targeted parcels. Internally, ACUB may use VENQ funds only if the parcels are culturally driven or driven by conservation of threatened or endangered species. Additionally, OMA or RDT&E funds may be used either through programmed budgets or as end of year funding becomes available.

5.2.6 Cooperative Ecosystem Studies Units

The Cooperative Ecosystem Studies Units (CESU) Network is a national consortium of federal agencies, tribes, academic institutions, state and local governments, non-governmental conservation organizations, and other partners working together to conduct collaborative and interdisciplinary applied projects that address natural and cultural heritage resource issues at multiple scales and in an ecosystem context. The network includes 17 CESUs that cover the U.S. and U.S. territories. CESUs are based at host universities and focused on a particular biogeographic region.

For APG, the applicable regional CESU is the Chesapeake Watershed CESU. The host institution for this CESU is the University System of Maryland represented by the University of Maryland Center for Environmental Science. This CESU is comprised of 28 university/research institutions and 9 federal agencies. These partners provide leadership in watershed science and stewardship with special emphasis on the watershed of the Chesapeake Bay. This CESU is a viable option for funding some of the projects of this INRMP.

5.3 STAFFING

As stated in DoDI 4715.03, the Army must ensure that sufficient numbers of professionally trained natural resources management personnel are available and assigned responsibility to manage the installation's natural resources. In addition, necessary supplemental training to ensure the proper and efficient management of the natural resources must be provided in a timely manner. Maintaining a sufficient number of trained personnel is a challenge at APG, with the extensive natural resources that APG must manage, and as environmental funding continues to decrease and positions are not expected to be back-filled as individuals retire.

5.3.1 Civilian Personnel

The Sikes Act, as amended by Public Law 108-136, the National Defense Authorization Act of 2004 states:

> "Professionally trained civilian biologists in permanent Federal Government career managerial positions are essential to oversee fish and wildlife and natural resources conservation programs and are essential to the conservation of wildlife species on military land."

APG's natural resources programs and responsibilities are staffed by Army civilian federal employees, supervised under the Environmental Integration Branch Chief. These employees are educated and/or professionally trained in the field of biology, environmental science, forestry, oceanography, or wildlife biology.

5.3.2 Other Personnel

The Oak Ridge Institute of Science and Education (ORISE) program is an option for providing supplemental staffing needs. The program offers internships, scholarships, fellowships and research experiences for students, post-graduates, and associate degree graduates. ORISE programs include research experiences at the U.S.

Department of Energy national laboratories as well as other federal agencies with research facilities. The ORISE participant is paid a stipend by the Army. The average ORISE appointment is three years.

5.3.3 Professional Development

The DPW Natural Resources staff is expected to keep current on regulatory requirements, best management and stewardship practices and is encouraged to attend workshops, seminars, or conferences as funding allows. Budgetary constraints often limit the ability to travel off-site for professional development opportunities. As a result, the DPW Natural Resources staff attempts to bring developmental/training opportunities to the installation. In 2012, an "Effective Environmental Contracting" course taught by a private consultant was offered on-site. A "Natural Resources Compliance" course (offered by the Naval Civil Engineer Corps Officers School and approved by the Interservice Environmental Education Review Board) was brought on-site in 2014.

IMCOM has partnered with the U.S. Army Environmental Command to administer and execute the IMCOM Environmental Training Plan. This plan offers a limited curriculum of centrally funded environmental courses and two professional conferences (Society of American Foresters; National Military Fish and Wildlife Association).

Various on-line webinars and training are available as developmental opportunities, and staff are encouraged to participate in those that support their field of work. There are numerous sources of on-line training. The Army Regional Environmental and Energy Office publishes a monthly newsletter ("Northern Review of Legislative and Regulatory Actions") which summarizes various on-line training courses; past newsletters can be found at http://www.asaie.army.mil/Public/ESOH/REEO/Northern/publications.html.

5.4 INRMP REVIEWS AND METRICS

5.4.1 Sikes Act Formal Review

The Sikes Act requires an INRMP to be reviewed for operation and effect no less often than every five years with the USFWS and the State fish and wildlife agency. The mandated review is intended to determine whether the INRMP is being implemented to meet the purposes and requirements of the Sikes Act and contribute to the conservation and rehabilitation of natural resources on the military installation. The review will determine whether the plan needs an update, revision, or is adequate with no changes needed. The following terms are defined in the tripartite MOU (July 2013):

- **Compliant INRMP**

  An INRMP that has been both approved in writing, and reviewed, within the past five years, as to operation and effect, by authorized officials of DoD, USFWS, and each appropriate State fish and wildlife agency

- **INRMP Update**

  Any change to an INRMP that, if implemented, is not expected to result in consequences materially different from those in the existing INRMP and

analyzed in an existing NEPA document; such changes will not result in a significant environmental impact, and installations are not required to invite the public to review or to comment on the decision to continue implementing the updated INRMP

- **INRMP Revision**

  Any change to an INRMP that, if implemented, may result in a significant environmental impact, including those not anticipated by the parties to the INRMP when the plan was last approved and/or reviewed as to operation and effect; all such revisions require approval by all parties to the INRMP, and will require a new or supplemental NEPA analysis

The outcome of the 5-year joint review is documented in a memorandum or letter summarizing the rationale for the conclusions the parties have reached. This written documentation should be jointly executed or in some other way reflect the parties' mutual agreement with signed record of coordination.

5.4.2 DoD Annual Review

As dictated in DoDM 4715.03, an INRMP is reviewed annually by the installation in cooperation with other interested parties to the INRMP. The USFWS and the State agency may be invited to participate in these annual reviews. The installation reviews the goals and objectives of the plan, establishes a realistic schedule for undertaking proposed actions, and determines adjustments needed to keep the INRMP current. The annual review can be less formal than the 5-year review, but is still documented through a memorandum or similar means. A documented annual review can substitute for a 5-year review provided the annual review is reasonably comprehensive and documents mutual agreement between the installation, USFWS, and State agency.

The annual review also generates annual assessments of the Natural Resources Conservation metrics. As stated in DoDI 4715.03:

> "Natural Resources Conservation metrics are used to assess the overall health and trends of each installation's natural resources program and to identify and correct potential funding and other resources shortfalls. The Sikes Act requires each installation with significant natural resources to report annually on the status of its INRMP implementation."

The Army reports progress toward meeting natural resources conservation program measures of merit to the Office of the Deputy Under Secretary of Defense (Installations and Environment) at each Environmental Management Review, and to Congress in the Defense Environmental Programs Annual Report to Congress. Each installation with significant natural resources reports:

1. The installation name and State

2. If the installation meets Sikes Act requirements

3. If annual feedback has been received from the USFWS (and NOAA Fisheries Service as applicable)

4. If annual feedback has been received from the State fish and wildlife agency

5. Funding requirements in reporting per fiscal year to implement the INRMP, including amount required for recurring projects, and amount required for non-recurring projects

The Army uses Natural Resources Conservation metrics to assess INRMP implementation, measure conservation efforts, ensure no net loss of military testing and training lands across the various installations, understand the conservation program's installation mission support, and indicate the success of partnerships with the USFWS, State fish and wildlife agencies, and NOAA Fisheries (as applicable). Seven focus areas assess requirements, goals, and objectives of the Sikes Act annually for each installation with an INRMP:

a. INRMP project implementation
b. Federally listed species and critical habitat
c. Partnerships effectiveness
d. Fish and wildlife management and public use
e. Team adequacy
f. Ecosystem integrity
g. INRMP impact on the installation mission

At a minimum, the following is assessed for each focus area:

a. INRMP Project Implementation

   (1) Are INRMP projects, including follow-up inventorying and monitoring work, properly identified, developed, and submitted for funding?

   (2) Has project funding been received, obligated, and expended?

   (3) Have projects been completed and do they meet expected objectives?

b. Federally Listed Species and Critical Habitat

   (1) Are conservation efforts effective?

   (2) Does the INRMP provide conservation benefits necessary to preclude critical habitat designation?

   (3) Are Species at Risk identified and are steps being undertaken to preclude listing?

c. Partnerships Effectiveness

   (1) Has the INRMP review team (i.e., DoD, USFWS, NOAA Fisheries, and State fish and wildlife agencies) been effective in ensuring the INRMP's implementation?

(2) Are other partnerships needed to meet the INRMP goals?

(3) Have other partnerships been effectively used to meet INRMP goals?

d. Fish and Wildlife Management and Public Use

(1) Are public recreational opportunities such as hunting, fishing, and wildlife viewing available to installation residents and employees?

(2) Are public recreational opportunities such as hunting, fishing, and wildlife viewing available to the public?

e. Team Adequacy

(1) Is the installation's natural resources team adequately resourced to fully implement the INRMP?

(2) Is the installation's natural resources team adequately trained to fully implement the INRMP?

(3) Does the installation encourage retaining existing natural resources personnel to maintain corporate knowledge and manage resources with the most qualified professionals to support the military mission?

f. Ecosystem Integrity

(1) To what extent are the installation's native ecological systems currently intact?

(2) In what ways are an installation's various habitats susceptible to change or damage from different stressors?

(3) What stressors affect each habitat type?

g. INRMP Impact on the Installation Mission

To what degree (i.e., high, medium, or low) is the INRMP and its associated actions supporting the installation's ability to sustain the current and potential future military mission?

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