INRMP

FORT BELVOIR INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. Army Garrison Fort
Belvoir, Virginia

Directorate of Public Works—
Environmental Division

August 2018

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Fort Belvoir
Integrated Natural Resources Management Plan

U.S. Army Garrison Fort Belvoir, Virginia

Directorate of Public Works—Environmental Division

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Integrated Natural Resources Management Plan U.S. Army Garrison Fort Belvoir Fort Belvoir, Virginia

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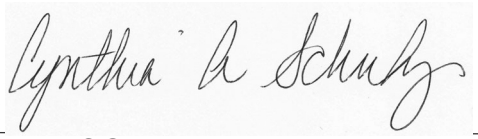
Approval

This Integrated Natural Resource Management Plan meets the requirements of the Sikes Act (16 USC 670a et seq.), as amended in the Sikes Act Improvement Act of 1997 and the Department of Defense Instruction (DoDI) 4715.03 Natural Resources Conservation Program. This document was prepared and reviewed in coordination with the Department of Interior, acting through the U.S. Fish and Wildlife Service, and the Virginia Department of Game and Inland Fisheries.



9/18/18

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Integrated Natural Resources Management Plan U.S. Army Garrison Fort Belvoir Fort Belvoir, Virginia

Approval

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8 Nov 2018

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Integrated Natural Resources Management Plan
U.S. Army Garrison Fort Belvoir
Fort Belvoir, Virginia

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1.0 FORT BELVOIR INRMP EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) will serve as a tool for current and future Fort Belvoir staff to successfully manage natural resources, in conjunction with military training and other diverse activities on the installation. This INRMP contains a list of recommended projects that if funded and implemented, will minimize mission workarounds, help meet military objectives, and support the goals of the Fort Belvoir Natural Resources Program.

The mission of Fort Belvoir's Natural Resources Management Program is to manage natural resources as an integral part of the military mission, using sound ecological principles to ensure biodiversity conservation is achieved while sustaining the economic and aesthetic value of the land, and to guarantee continued access to installation land, air and water resources realistic military training and testing. This INRMP will help provide the guidance necessary to ensure installation compliance with natural resources laws and regulations, as well as public access and customer service support to base operations, tenants, military personnel and their families; the research and education community; and the general public.

Within the metropolitan Washington D.C. area, Fort Belvoir represents a significant tract of native vegetation in terms of size, diversity, and position relative to the location of off-post tracts of native vegetation. Fort Belvoir has therefore recognized the ecological importance of on-post natural habitats by designating the three installation refuges, the two installation conservation corridors, and wetlands and steep-sloped areas as environmentally constrained areas. These large areas of native vegetation provide a contiguous band of wildlife habitat through the installation, and connect with wildlife habitat areas outside the installation.

Given the size of Fort Belvoir, its diverse set of mission requirements and unique abundance of natural resources, successfully implementing this INRMP requires a combination of government staff persons, contract labor, and partners (including volunteers). The Fort Belvoir Environmental Division Chief is responsible for enforcing compliance with the INRMP. All requirements and subsequent recommended projects set forth in this INRMP are subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 USC Section 1341). No obligation undertaken by Fort Belvoir under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose. This INRMP maintains the management philosophy, as well as the program management goals, objectives and strategies from the previous INRMP (U.S. Army, 2001), because there have not been major changes to the installation's natural resources management program from 2001 to 2018.

Fort Belvoir's natural resources management program is fully integrated among all natural resources disciplines. Consequently, implementation of management actions is not necessarily discipline-specific. However, to facilitate the presentation of the natural resources management program in this INRMP, the program is defined and described in terms of five major disciplines: Water Resources; Vegetation; Fish and Wildlife; Threatened and Endangered Species; and Special Natural Areas. For each discipline, the INRMP describes baseline conditions and presents related management policies, objectives, management actions to date, and recommended future management activities. The INRMP further outlines strategies and the need for funding to implement recommended projects in support of the Fort Belvoir mission and long term management of installation natural resources.

There are several legal authorities that require military installations to have an INRMP. Specifically, under the Sikes Act (16 USC 670a et seq., as amended), the U.S. Department of Defense (DoD), with the assistance of the United States Fish and Wildlife Service (USFWS) and the respective state fish and wildlife agency, is responsible for carrying out programs and implementing management strategies to conserve and protect biological resources on its lands. Because military lands and waters are often protected from human access and impact, they contain some of our nation's most significant remaining large tracts of land with valuable natural resources.

This INRMP describes how Fort Belvoir will implement provisions of the Sikes Act, as well as other DoD, Army, federal and applicable state regulations. The Sikes Act also requires coordination with the USFWS and the Virginia Department of Game and Inland Fisheries (VDGIF) to obtain their signatory approval of this plan. Army Regulation 200-1 and Department of Defense Instruction (DODI) 4715.03 require installations to review their INRMPs annually and revise them as necessary. Reviews of the INRMP for operation and effect are to be undertaken no less often than every 5 years. Fort Belvoir will invite USFWS and VDGIF to participate in the annual reviews, and to review and re-sign the INRMP every 5 years. The results of the annual reviews will be incorporated into the INRMP as updates. This INRMP will take effect upon signature of the Fort Belvoir Garrison Commander.

This INRMP presents a package that will (1) comply with all applicable natural resources statutes, regulations, policies, and directives; (2) conserve and enhance Fort Belvoir's natural resources; (3) support the military mission; (4) provide for balanced public access to and use of installation natural resources, consistent with conservation objectives; and (5) promote and enhance the installation's relationship with the public. This plan will not resolve all existing and/or future environmental issues or conflicts. It does, however, attempt to minimize these issues and conflicts by providing a basis for natural resources-related decision-making.

2.0 INRMP OVERVIEW

The preparation of this Integrated Natural Resources Management Plan (INRMP) involved the review and analysis of natural resource management practices in place since the 2001 INRMP, current and anticipated natural resources regulatory requirements and policies, ongoing programs, and the current conditions of the existing resources. The review process included coordinating with key personnel from Fort Belvoir and other Army entities, as well as from federal and state agencies such as the US Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (VDGIF); collecting existing environmental documentation; and conducting field reconnaissance of the installation.

2.1 PURPOSE, SCOPE AND AUTHORITY OF THE INRMP

The U.S. Department of Defense (DoD), with the assistance of the USFWS, is responsible under the Sikes Act (16 USC 670a et seq., as amended) for carrying out programs and implementing management strategies to conserve and protect biological resources on its lands. Because military lands and waters often are protected from human access and impact, they contain some of our nation's most significant remaining large tracts of land with valuable natural resources. Congress established the Sikes Act in 1960 to manage these lands for wildlife conservation and human access. The Sikes Act amendment of 1997 broadened the scope of installation natural resources management programs to include the requirement to develop and implement mutually agreed upon INRMPs through voluntary cooperative agreements among the DoD installation, USFWS, and the respective state fish and wildlife agencies.

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

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

Department of Defense Manual (DODM) 4515.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual, dated 25 November 2013, provides the procedures to prepare, review, update, and implement INRMPs in compliance with the Sikes Act.

The Army's commitment to natural resources management is emphasized in Army Regulation (AR) 200-1 (Environmental Protection and Enhancement), which requires that INRMPs be developed and maintained for all Army installations with significant natural resources.

INRMPs are planning documents that outline how each military installation with significant natural resources will manage these resources. They integrate military mission requirements, environmental and master planning activities, cultural resources protection requirements, and outdoor recreation to ensure both military operations and natural resources conservation are included and consistent with stewardship and legal requirements. Two of the major program goals of AR 200-1 are to "integrate environmental stewardship and compliance responsibilities with operational requirements to help achieve sustainable ranges and training areas" and to "develop, initiate, and maintain forward-looking programs for the conservation, utilization, and rehabilitation of natural resources on Army lands" (HQDA, 2007).

Title 32 of the Code of Federal Regulations (CFR) Part 651, Environmental Analysis of Army Actions, "sets forth policy, responsibilities, and procedures for integrating environmental considerations into Army planning and decision making" (67 Federal Register [FR] 15290, March 29, 2002). In particular, 32 CFR 651.12, *Integration with Army Planning*, states that "The Army goal to integrate environmental reviews concurrently with other Army planning and decision making actions avoids delays in mission accomplishments. To achieve this goal, proponents should provide complete environmental documents for early inclusion with any recommendation or report to decision makers (Master Plan, Natural Resources Management Plan, Remedial Investigation, FS [Feasibility Study], etc.). The same documents will be forwarded to planners, designers, and/or implementers so that recommendations and mitigations on which the decision was based may be carried out."

The National Environmental Policy Act (NEPA) was created to ensure federal agencies consider the environmental impacts of their actions and decisions using a systematic interdisciplinary approach to environmental planning and evaluation of projects. Although NEPA is not an authority in the requirement for and development of this INRMP, the NEPA process for environmental review and documentation is followed in implementation of the INRMP.

This INRMP reflects Fort Belvoir's commitment to conserve, protect, and enhance the natural resources necessary to provide sustainable military training for soldiers.

In accordance with DoDI 4715.03 and AR 200-1, this INRMP is based on the principles of ecosystem management. It addresses how natural resources on Fort Belvoir will be managed to allow for multipurpose uses of, and public access to, those resources, and for conservation of those resources, while ensuring no net loss in the capability of an installation to support its military mission.

All requirements set forth in this INRMP requiring the expenditure of Fort Belvoir's funds are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 USC Section 1341). No obligation undertaken by Fort Belvoir under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose.

2.2 FORT BELVOIR'S NATURAL RESOURCES MANAGEMENT PROGRAM PHILOSOPHY

Fort Belvoir has developed and implemented an ecosystem-based natural resources management program that emphasizes biodiversity conservation. Fort Belvoir's vision for the natural resources management program is to manage natural resources using sound ecological principles in an appropriate landscape context (e.g., local, regional, and national), to support the military mission, and to continue to provide opportunities for future generations to access and use the installation's natural resources, consistent with resource conservation, and with mission and operational security requirements. Natural resources management emphasis is on maintaining the existing level of biodiversity.

It is the mission of Fort Belvoir's natural resources management program to manage natural resources as an integral part of Fort Belvoir's military mission. As such, this INRMP addresses compliance with natural resources laws and regulations; providing customer service support to base operations, tenants, military personnel and their families; and providing for public access and opportunities for the research and education community.

The goals, objectives and strategies contained in this INRMP were developed in accordance with Fort Belvoir's natural resources management philosophy and mission. Most of the management actions are continuations of existing actions established under the 2001 INRMP. Management will continue to prioritize conserving and enhancing natural resources, while providing balance among the multiple legitimate uses and users of these resources. Continued support of military training and testing will take primacy.

Conservation emphasis will be on those resources with recognized conservation priority, such as federal endangered or threatened species, and will be in accordance with established DoD and Department of Army (DA) natural

resources management policies, and DoD and DA commitments to natural resource stewardship programs, such as the Chesapeake Bay Program (CBP) and the Partners in Flight (PIF) Program. All of the installation's natural resources management actions will be in accordance with applicable federal, state, local, DoD, DA, and Fort Belvoir regulatory requirements and policy. The installation's natural resource management strategies also take into account (as stewardship considerations and not regulatory requirements) natural heritage data and resource management recommendations from the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH), the state agency responsible for inventory, database maintenance, and protection and management of Virginia's natural heritage resources (i.e., the habitats of rare, threatened, or endangered plant and animal species, rare or state significant communities, and other natural features.

This INRMP continues the management philosophy, as well as the program management goals, objectives and strategies from the 2001 INRMP (U.S. Army, 2001). As such, there has not been major change to the installation's natural resources management program between the 2001 INRMP and this INRMP.

2.3 RESPONSIBLE PARTIES

Fort Belvoir's structure is composed of 15 garrison offices and directorates that report to the Garrison Commander (Richard, 2017). Additionally, Fort Belvoir hosts approximately 150 tenant agencies. Garrison organizations and other parties that may participate in implementing this INRMP are listed in Tables 2-1 through 2-4.

Table 2-1: Installation Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
Garrison Commander	The Garrison Commander is responsible for the overall management of Fort Belvoir's lands, facilities, and operations.	• Ensures Fort Belvoir has funding, staff, and other resources necessary to manage installation's natural resources • Establishes and enforces policies involving fish and wildlife and other natural resources management within Fort Belvoir • Ensures the INRMP is implemented • Ensures land utilization is planned to avoid or minimize adverse effects on environmental quality and to provide for sustained accomplishment of the mission.
Directorate of Public Works (DPW)	DPW is the lead organization to implement this INRMP. The Environmental Division is the lead division for INRMP; the other divisions within the DPW have broad responsibilities for facilities siting, construction, operations and maintenance, and for overseeing private partners.	• **Conservation Branch**: responsible for and manages natural and cultural resources on Fort Belvoir. Natural resources management programs include fish and wildlife; rare, threatened and endangered species; vegetation; forestry; water resources; wetlands; and integrated pest management. Also responsible for managing public access to natural resources on post. • **Environmental Compliance Branch**: responsible for and manages solid waste and recycling; hazardous waste and materials; medical waste; underground and above ground storage tanks; pollution prevention; drinking water and waste water; industrial stormwater and Municipal Separate Storm Sewer Systems (MS4) stormwater; Total Maximum Daily Load (TMDL); spill response; asbestos; mold; lead-based paint; air quality; Emergency Planning and Community Right-to-Know Act (EPCRA); and National Environmental Policy Act (NEPA). • **Restoration Branch**: responsible for and manages all processes and provisions of the Defense Environmental Restoration Program (DERP) and Defense Environmental Restoration Account (DERA). Manages historical contamination from munitions through the Military Munitions Response Program (MMRP) and historical contamination not related to munitions through the Installation Restoration Program (IRP) in accordance with the Comprehensive

Table 2-1: Installation Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
		Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). • **Facility Planning Division**: maintains and keeps track of all real property on the installation; updates the Real Property Master Plan (RPMP); tracks space management and utilization; and updates the Installation Status Report (ISR) for infrastructure. Provides Geographic Information System (GIS) services to the installation. • **Engineering Division:** provides quality control over contract work actions, and prepares independent government cost estimates for operations and maintenance-related projects; provides technical engineering and design consulting services; and manages construction. • **Housing Division**: responsible for managing the installation's family housing and troop billeting. • **Business Operations and Integration Division (BOID):** oversees the Work Management of all projects and service orders that are performed within DPW or via the Real Property Maintenance Contract. Performs Financial and Project Management within the General Financial Enterprise Business System (GFEBS) and Collaborative Projects. Builds the Annual Work Plan, Spend Plans, and Resource Plan. Pays the utility bills; reviews and updates Interagency Support Agreements (ISAs); orders supplies; tracks training requirements; is responsible for all personnel actions, security background checks and clearances, time and attendance, strategic planning, and cost analysis; certifies Government Purchase Cards; tracks all taskers; dispatches General Services Administration (GSA) vehicles; and produces reports for Higher Headquarters.

Table 2-1: Installation Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
		• **Operations and Maintenance Division (O&M):** operates and maintains Fort Belvoir's real property, utilities infrastructure, and grounds; administers the Real Property Maintenance Contract; performs quality control over contract work actions; and, prepares independent government cost estimates for operations and maintenance-related projects.
Directorate of Emergency Services (DES)	DES provides continuous and professional law enforcement, access control, and fire and emergency services to Fort Belvoir and other designated areas of responsibility, in order to maintain the safety and security of soldiers, family members, and civilians who live and work on Fort Belvoir.	• Law Enforcement Division: enforces all hunting and fishing laws, as well as other natural and cultural resources laws. • Fire Protection and Prevention Division: responsible for preventing and suppressing fires on the installation
Directorate of Family, Morale, Welfare, and Recreation (DFMWR)	DFMWR is responsible for developing and operating outdoor recreation programs.	• **Outdoor Recreation**: coordinates recreational activities with DPW to ensure safety and compliance issues are addressed, and with Directorate of Plans, Training, Mobilization, and Security (DPTMS) to ensure that recreational activities do not occur in the same vicinity as training activities. • Responsible for the administrative portion of the installation's hunting program. • Coordinates with DES regarding regulatory issues/law enforcement and emergency response.
Directorate of Plans, Training, Mobilization, and Security (DPTMS)	DPTMS has control over installation troop projects, operations, and support.	• Reviews all non-training uses of training lands (e.g., biological surveys, recreational activities, hunting, etc.). • Implements emergency, contingency, and operational plans.

Table 2-1: Installation Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
Staff Judge Advocate (SJA)	SJA delivers principled, responsive counsel and mission-focused legal services to the Garrison Command and staff; to soldiers, families, civilians, and retirees; and to designated partner organizations.	• Provides advice about the statutory and policy framework in which the INRMP is implemented. • Ensures that all violations of federal, Commonwealth of Virginia, and local fish and wildlife regulations are investigated and prosecuted as appropriate. • Involved in enforcement actions; legal interpretation; development of cooperative agreements, Memoranda of Understanding (MOUs), and compliance agreements; compliance with applicable environmental and natural resource management laws and regulations, and review authority on actions.
Other Installation Organizations	Implementation of this INRMP requires participation from other installation organizations usually in a support capacity.	• These include, but are not limited to, Mission and Installations Contracting Command (MICC), Directorate of Human Resources (DHR), Civilian Personnel Advisory Center (CPAC), and commanders of major subordinate organizations, tenant units, and activities
Directorate of Resource Management (DRM)	DRM handles all financial and personnel resourcing for the installation	• Develops and executes plans, programs, and budgets to obtain the manpower and financial resources needed to accomplish Fort Belvoir's mission.
Public Affairs Office (PAO)	Formulates and implements all command information to the public	• Responsible for providing timely and accurate information about the INRMP and related activities to installation personnel and to the public.
Fort Belvoir Community Hospital	Within the Army's Medical Department (AMEDD), Fort Belvoir's Community Hospital is the central facility of a comprehensive health care system serving military families residing in Northern Virginia	• Health services include the hospital's Department of Public Health, which oversees issues such as environmental health and epidemiology, including monitoring tick and mosquito populations for vector-borne diseases.

Table 2-1: Installation Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
McNellis Veterinary Clinic	A clinic that treats animals within Fort Belvoir	• Provides drugs and reviews dosages for tranquilizing and treating problem or injured animals. • Provides treatment for sick or injured wildlife as appropriate.
Criminal Investigation Division (CID)	Investigates criminal activity throughout Fort Belvoir	• Responsible for investigating offenses and enforcing the Clean Water Act.
Other Tenant Organizations	Implementation of this INRMP requires assistance from/coordination with tenant organizations	• Responsible for ensuring that their operations and activities are consistent with natural resources management policies of this INRMP. • Coordinates with DPW-Environmental Division on natural resources issues.

Table 2-2: Other Defense and Federal Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
Assistant Chief of Staff for Installation Management (ACSIM)	ACSIM provides policy guidance and program management on all matters relating to overall management and resourcing of Army installations worldwide	• Assures the availability of efficient, effective base services and facilities. • Approves installation regulations that are based on Army regulations, the installation Real Property Master Plan, biological assessments, and environmental impact statements.
Installation Management Command (IMCOM)	IMCOM handles the day-to-day operations of Army installations by integrating and delivering base support to enable Army readiness.	• Manages the installation's personnel, operations, facilities, training, and logistics in support of the INRMP.
Military District of Washington (MDW)	The Major Command (MACOM) for Fort Belvoir is the MDW.	• Provides priorities, guidance, command and control.
Army Environmental Command (AEC)	AEC provides technical guidance and support to installations on issues pertaining to natural resource management	• Provides environmental services and solutions in support of natural resources management through expertise, contract support, and partnering.
United States Army Corps of Engineers (USACE)	Fort Belvoir has the option to use the USACE's contracts as vehicles for natural resource management, and to access USACE organizations such as the Engineer Research and Development Center (ERDC) and the Construction Engineering Research Laboratory (CERL) for technical assistance	• Provides contract management, construction management, and natural resource technical assistance.
Army Public Health Command (APHC)	APHC provides military preventative services and veterinary support to Fort Belvoir staff and soldiers	• Provides technical guidance and support to installations on pest management. • Supports the installation in the revision and update of the integrated pest management plan.

Table 2-2: Other Defense and Federal Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
DoD Natural Resource and Conservation Programs	To include but not limited to Partners in Flight (PIF), Partners in Amphibian and Reptile Conservation (PARC)	• Sustains and enhances the military testing, training, and safety mission through proactive, habitat-based. management strategies that maintain healthy landscape and training lands. • Effectively manages wildlife on DoD lands focusing on habitat and species management; inventory, research, and monitoring; and education, outreach, and training.
U.S. Fish and Wildlife Service (USFWS)	USFWS is a signatory agency of this INRMP, as required by the Sikes Act	• Contributes in implementing the INRMP. • Responsible for regulating and enforcing laws affecting federal threatened and endangered species, and fish and wildlife. • Provides technical support and services to Fort Belvoir • Manages the Potomac River National Wildlife Refuge Complex, which is located approximately 3 miles southwest of Fort Belvoir.
National Park Service (NPS)	Preserves the unimpaired natural and cultural resources and values of the NPS for the enjoyment, education, and inspiration of this and future generations.	• Plans for, and maintains, a system of trails throughout the region, including the Potomac Heritage National Scenic Trail (PHNST) being planned along the perimeter of Fort Belvoir. • Responsible for managing lands and facilities, including the National Capital Region Parks.
United States Geological Survey (USGS)	Scientific agency for natural sciences, including earth science and biology	• Provides support in biological, water quality, and hydrologic surveys. • Maintains national-level databases.
National Marine Fisheries Service (NMFS)	Responsible for the stewardship and management of living marine resources and their habitat	• Provides technical assistance for anadromous fish management. • Responsible for the stewardship of the nation's ocean resources and their habitat. • Issues permits under the Marine Mammal Protection Act and the Endangered Species Act for activities that may result in the "take" of a protected species.

Table 2-2: Other Defense and Federal Organizations		
Organization Name	**Description**	**INRMP Responsibilities**
United States Department of Agriculture (USDA)	Provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues based on public policy, the best available science, and effective management.	• Provides technical assistance to pest management, wildlife, animal quarantine; enacts and enforces quarantine actions. • **U.S. Forest Service (USFS):** In 1990 the USFS and Fort Belvoir signed an interagency agreement to provide cooperative support, coordination, and cost sharing for biological evaluations and specific pest control operations (Appendix A). • **Animal and Plant Health Inspection Service (APHIS):** Responsible for the investigation and enforcement of alleged violations relating to animal and plant issues under APHIS' jurisdiction. Provides technical advice and services for managing problem wildlife species and bird aircraft strike hazard planning. Maintains a national database on exotic species and their management.
Chesapeake Bay Program (CBP)	CBP focuses on undertaking cooperative efforts to reduce nutrient and toxic pollution to the Chesapeake Bay, restore habitat and living resources, and coordinate research. The U.S. Environmental Protection Agency's (USEPA) Region III Office and Office of Water jointly operate the CBP.	• Coordinates projects and activities to restore and protect the Chesapeake Bay.
National Capital Planning Commission (NCPC)	NCPC, as the principal planning agency for the federal government in the National Capital Region (which includes Fairfax County), produces a Comprehensive Plan that is a statement of growth and development policies.	• Reviews plans and programs proposed by various agencies, and considers them according to its goals for the National Capital Region.

Table 2-3: State Agencies		
Organization Name	**Description**	**INRMP Responsibilities**
Virginia Department of Game and Inland Fisheries (VDGIF)	VDGIF has legal authority for fish and wildlife in Virginia. VDGIF is a signatory agency for this INRMP, as required by the Sikes Act	• Contributes in implementing the INRMP. • Responsible for regulating and enforcing laws affecting state-listed threatened and endangered species, and fish and wildlife, including hunting and fishing laws. • Provides technical support and services to Fort Belvoir.
Virginia Department of Environmental Quality (VDEQ)	VDEQ administers state and federal laws and regulations for water quality, water supply, air quality, and land protection	• Has primary responsibility for regulating and enforcing air and water quality. • Responsible for regulating non-tidal wetlands by issuing wetland permits. • Regulates stormwater through industrial and municipal separate storm sewer system (MS4) permits
Virginia Department of Forestry (VDOF)	VDOF helps landowners manage and monitor forest resources through a cost-share program	• Provides technical services regarding forest management to Fort Belvoir.
Virginia Marine Resources Commission (VMRC)	VMRC is responsible for the Commonwealth's marine and aquatic resources	• Regulates subaqueous lands in Virginia through a joint federal/state/local permit process.
Virginia Department of Conservation and Recreation (DCR)	DCR is responsible for preserving Virginia's natural and recreational resources, including the Natural Heritage Program.	• Maintains databases of rare, threatened and endangered species; significant habitats; and exotic invasive species. • Manages the Mason Neck State Park, located approximately 2.8 miles southwest of Fort Belvoir. • Advises VDGIF and USFWS regarding conservation of sensitive species.
Virginia Department of Historic Resources (VDHR)	VDHR is the State Historic Preservation Office (SHPO).	• Responsible for fostering, encouraging, and supporting the stewardship of Virginia's significant historic architectural, archaeological, and cultural resources. • Division of Review and Compliance serves to advise and assist Federal and state agencies in determining if their

Table 2-3: State Agencies		
Organization Name	**Description**	**INRMP Responsibilities**
		projects will affect significant historic/cultural resources and, if so, how to address and resolve those effects.
Virginia Department of Agriculture and Consumer Services (VDACS)	VDACS promotes the economic growth and development of Virginia agriculture, provides consumer protection, and encourages environmental stewardship.	• Responsible for Virginia's animal control, care and welfare mandates, as well as animal disease control, prevention, and diagnostics. • Office of Pesticide Services certifies applicators, registers products, and licenses pesticide businesses for the safe and effective control of pests. • Protects and manages state-listed endangered and threatened plant and insect species.

Table 2-4: Regional and Local Agencies		
Organization Name	**Description**	**INRMP Responsibilities**
Fairfax County	County level local government	• **Fairfax County Health Department:** coordinates with the installation pest management program manager for monitoring and control of mosquitoes. • **Fairfax County Fire and Rescue Department:** under the provisions of AR 420-90, *Fire and Emergency Services*, Fort Belvoir has a cooperative agreement with Fairfax County Fire and Rescue. • **Fairfax County Department of Planning:** provides GIS data to Fort Belvoir. Administers a wetland permit program through the Wetlands Board. • **Fairfax County Park Authority**- works with the installation on regional ecosystem and land management initiatives. Manages Huntley Meadows County Park, which is adjacent to Fort Belvoir and several other county parks in the area.
Northern Virginia	Inter-jurisdictional organizations	• **Northern Virginia Regional Parks Authority:** coordinates with on regional ecosystem management initiatives. • **Northern Virginia Regional Planning Commission**: coordinates on regional issues and initiatives, including a regional trails system and climate resilience. • **Northern Virginia Soil and Water Conservation District:** provides technical advice and offers workshops on stream restoration and stormwater management. • **Metropolitan Washington Council of Governments:** coordinates the implementation of public health and safety initiatives.
Universities and Institutions	Includes, but is not limited to, George Mason University, American University, and The Smithsonian Institute.	• Universities may be contracted to provide specialized services, such as technical support in natural resources management and technical expertise on specific resource issues.

Table 2-4: Regional and Local Agencies		
Organization Name	**Description**	**INRMP Responsibilities**
Non-Government Organizations (NGOs)	Includes, but is not limited to, the Audubon Society, Audubon Society of Northern Virginia, Virginia Bluebird Society, Alice Ferguson Foundation, and Boy Scouts of America.	• Partnerships are created with local, state, and national organizations relating to, but not limited to, natural and environmental resource management.

2.4 CONSULTING PARTIES

Fort Belvoir currently has a formal consulting relationship with five Native American tribes: the Catawba Indian Nation, Eastern Band of Cherokee Indians, Pamunkey Indian Tribe, Tuscarora Nation of New York, and United Keetoowah Band of Cherokee Indians in Oklahoma. They will be included as consulting parties on this INRMP. Additionally, Fort Belvoir will be extending an invitation to consult to the tribes in Virginia that gained federal recognition in January of 2018 but have yet to enter into a formal relationship with Fort Belvoir: Chickahominy Indian Tribe, Chickahominy Indians Eastern Division, Upper Mattaponi Tribe, Monacan Indian Nation, Rappahannock Tribe, and Nansemond Indian Tribe

2.5 REVIEW, REVISION AND REPORTING

AR 200-1 requires installations to review their INRMPs annually and to revise them as necessary. Reviews of the INRMP for operation and effect are to be undertaken no less often than every 5 years. Previous NEPA documentation are to be assessed to ensure that the effects of the natural resources management practices in future INRMP updates have been adequately addressed.

This INRMP will take effect upon signature of the Fort Belvoir Garrison Commander. With signature anticipated in 2018, the initial five-year period will be from 2018 – 2023.

Fort Belvoir will review this INRMP annually to address the effectiveness of INRMP implementation. Fort Belvoir will invite the USFWS and Virginia Department of Game and Inland Fisheries (VDGIF) to participate in the annual reviews, and to review and re-sign the INRMP every 5 years. The results of the annual reviews will be incorporated into the INRMP as updates. Fort Belvoir will revise the INRMP, as needed, to address any significant changes.

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3.0 US ARMY GARRISON FORT BELVOIR

3.1 MILITARY MISSION

Fort Belvoir's mission is to provide installation base support to enable readiness. Fort Belvoir garrison organizations operate and maintain the installation; provide quality installation support and services to its customers and to plan, maintain, and execute mobilization readiness, military operations, and contingency missions. Since the departure of the Engineer School in 1988, the emphasis of Fort Belvoir's mission has shifted from training to providing logistical and administrative support to its tenants.

Fort Belvoir functions as an intelligence, medical, community, administrative, operational, family housing and logistics support center with approximately 145 government and non-government tenants. The installation has over 500 buildings with approximately 18 M square feet (SF). Military training at Fort Belvoir consists of occupation-specific training for the units assigned to the installation. As of 2017, Fort Belvoir had a residential population of approximately 7,500, a working population of approximately 40,000, and supported a regional population of approximately 140,000.

3.2 INSTALLATION LOCATION AND SETTING

Fort Belvoir occupies approximately 8,500 acres in southeastern Fairfax County, Virginia, about 18 miles southwest of Washington, DC and 95 miles north of Richmond, the Virginia state capital (Figure 3.1). Fort Belvoir has two separate land areas – Main Post (approximately 7,700 acres) and Fort Belvoir North Area (FBNA) (approximately 800 acres) - roughly 1.5 miles apart. Main Post is bisected by U.S. Route 1 into two distinct areas – North Post and South Post/Southwest Training Areas (Figure 3.2). North Post is further subdivided by the Fairfax County Parkway into Davison Army Airfield (DAAF) to the west and North Post to the east. South Post is further divided by Accotink Creek into Southwest Training Area to the west and South Post to the east.

Fairfax County, home to about 1.1 million people, is the most populous jurisdiction in the National Capital Region. Mostly suburban in character, the County combines residential developments of various densities with major employment and commercial centers. The County is surrounded by other jurisdictions that are similarly developed (City of Alexandria and Arlington County, both in Virginia), or that have portions that have become more developed over the last several decades as the Washington DC metropolitan area has expanded (Prince William and Loudon counties in Virginia).

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Miles

GENERAL LOCATION OF FORT BELVOIR

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Figure 3.1

Source: ESRI, USGS

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Local land uses outside the installation are predominantly residential, although commercial strip developments occur along major roads such as U.S. Route 1, and industrial developments occur along the Interstate 95 (I-95) corridor in the vicinity of FBNA. Major transportation corridors, such as U.S. Route 1, I-95, Fairfax County Parkway, Telegraph Road, and Jeff Todd Way pass through, or alongside, Fort Belvoir. Major utility, water, waste water, gas, and electric lines pass through or alongside the installation.

Southeastern Fairfax County has a number of sizable tracts that are in public ownership, or that are in private ownership and under conservation management (Table 3-1, Figure 3.3). These include Huntley Meadows County Park adjacent and to the north of Main Post; Woodlawn Plantation and Pole Road Park adjacent and to the east of Main Post; Grist Mill Park, Mount Vernon Estate, Fort Hunt National Park, and George Washington Memorial Parkway to the east; and, Pohick Bay Regional Park, Gunston Hall Plantation, Potomac River Mason Neck National Wildlife Refuge Complex, and Mason Neck State Park to the southwest. As shown in Figure 3.3, these areas align as a fairly contiguous corridor of undeveloped land/open space.

Fort Belvoir is located along the Potomac River, within the Chesapeake Bay Watershed. This geographical location contributes to the significance of natural resources management activities on Fort Belvoir.

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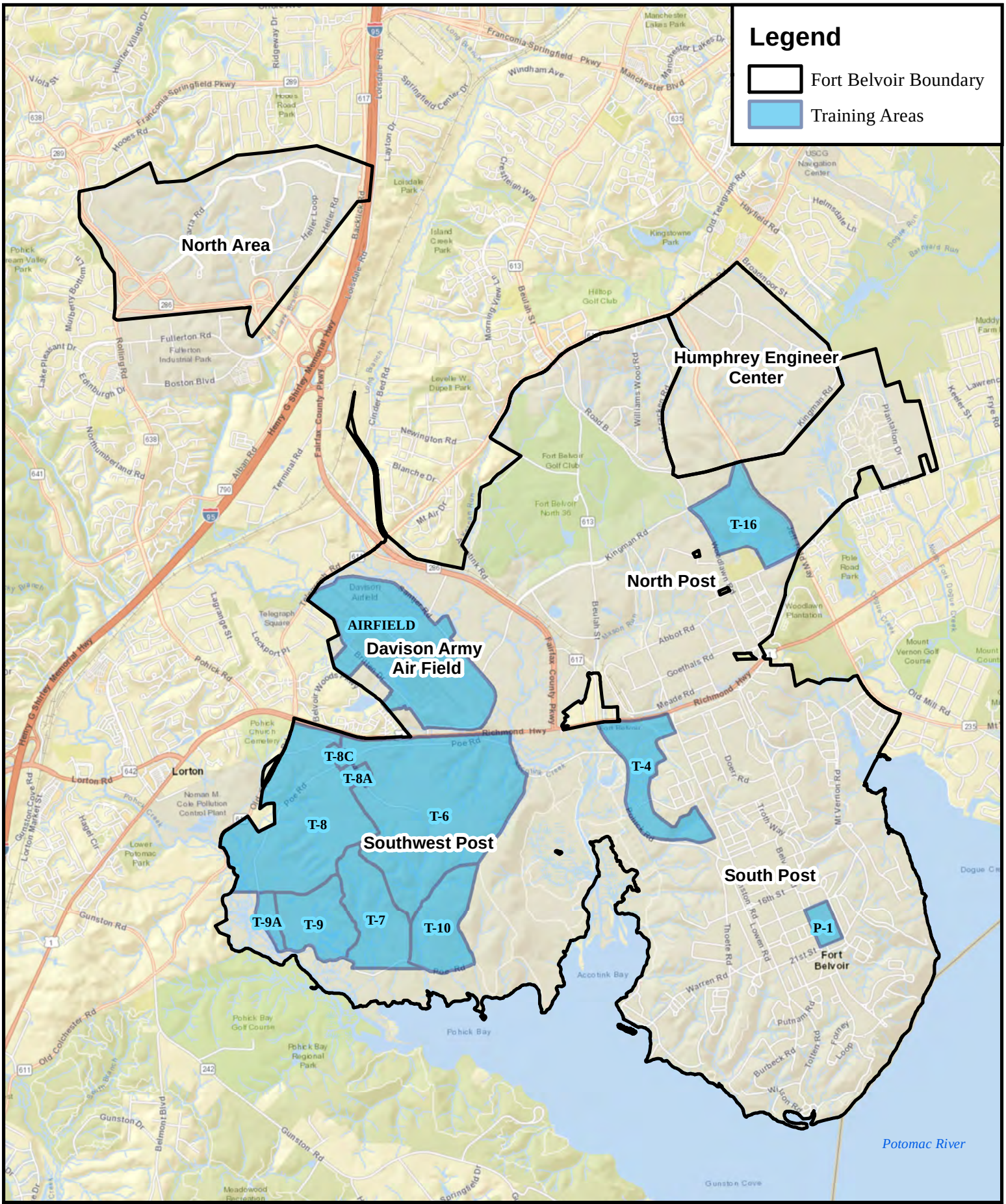

TRAINING AREAS ON FORT BELVOIR

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Figure 3.2

Source: Google road maps, Fort Belvoir GIS

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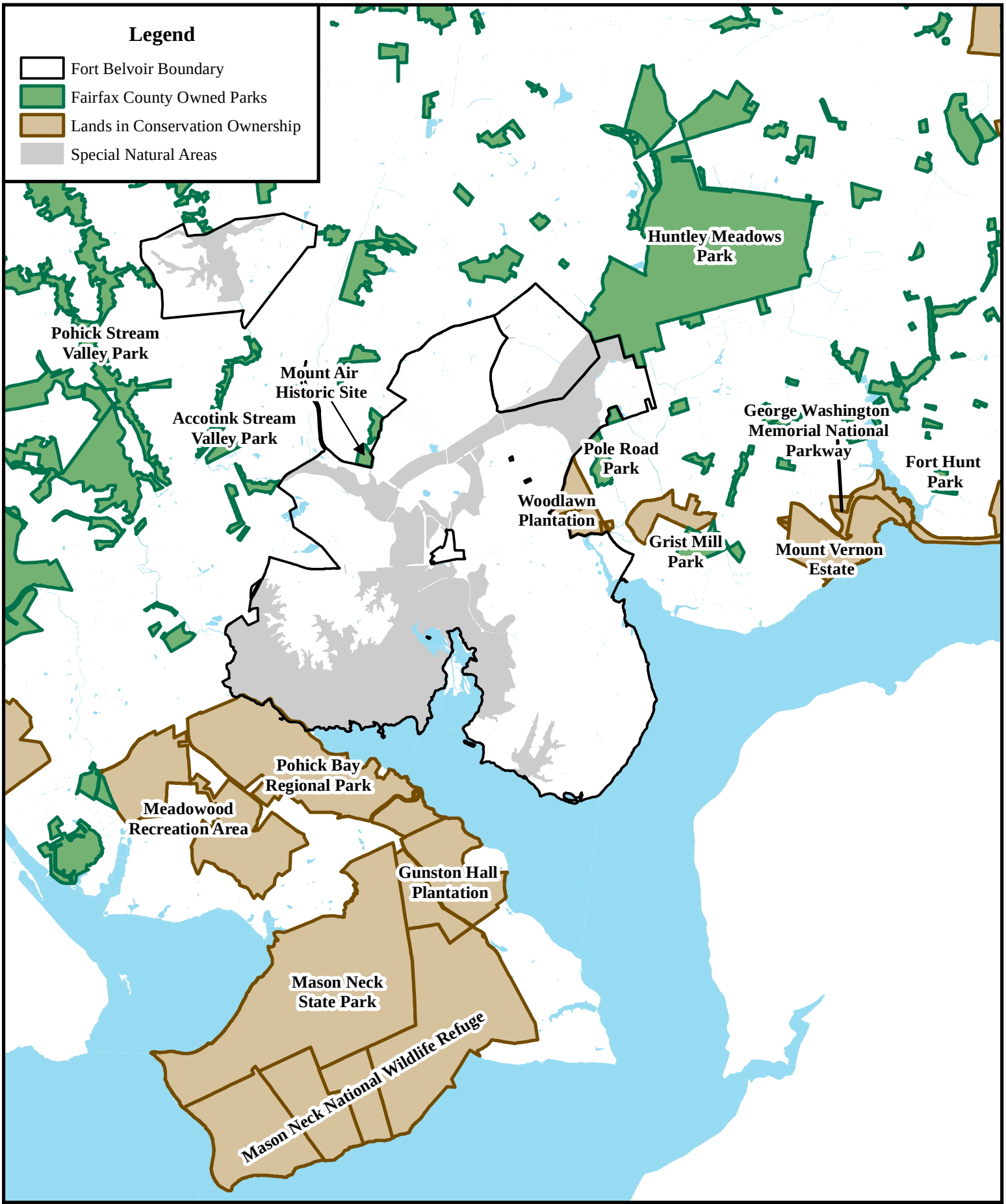

LANDS IN CONSERVATION OWNERSHIP

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Figure 3.3

Source: Fairfax County GIS Center, Fort Belvoir GIS

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Table 3-1: Major Conservation Lands Near and Adjacent to Fort Belvoir				
Parcel or Property Name	**Land Use, Function, or Primary Management Goal**	**Ownership or Managing Entity**	**Approx. miles*/ bearing from Fort Belvoir**	**Area* (approx. acres)**
Huntley Meadows County Park	Local passive recreational park and wildlife management area	Fairfax County Park Authority	Adjacent, N 50° E	1,400
Pohick Bay Regional Park	Local active and passive recreation	Northern Virginia Park Authority	Adjacent, S 40° W	1,150
Woodlawn Plantation	National Historic Site	National Trust for Historic Preservation	Adjacent, East	80
Pole Road Park	Local active and passive recreation	Fairfax County Park Authority	Adjacent, East	40
Grist Mill Park	Active recreation, team sports, and playing fields	Fairfax County Park Authority	0.4, East	95
U.S. Coast Guard facilities	Various	U.S. Department of Transportation	0.6, N 35° E	185
Gunston Hall Plantation	National Historic Site	Commonwealth of Virginia	1.1, S 35° W	700
Mount Vernon Estate	National Historic Site	Mount Vernon Ladies Association	1.2, N 85° E	525

Table 3-1: Major Conservation Lands Near and Adjacent to Fort Belvoir				
Parcel or Property Name	**Land Use, Function, or Primary Management Goal**	**Ownership or Managing Entity**	**Approx. miles*/ bearing from Fort Belvoir**	**Area* (approx. acres)**
Pohick Creek Stream Valley Parks	Local active and passive recreation	Fairfax County Park Authority	2.1, N 60° W	280
Mason Neck State Park	Regional active and passive recreation and wildlife management	Virginia Department of Conservation and Recreation	2.8, S 15° W	1,800
George Washington Memorial Parkway	Scenic drive and local active and passive recreation	National Park Service	3.0, East and North	7,200
Mason Neck National Wildlife Refuge (part of the Potomac River National Wildlife Refuge Complex)	Wildlife habitat preservation	U.S. Fish and Wildlife Service	3.0, S 30° W	1,050
Accotink Stream Valley Park	Local active and passive recreation	Fairfax County Park Authority	3.1, N 20° W	55
Piscataway Park	National colonial farm and natural area maintained for views from Mount Vernon	National Park Service	3.8, East	4,050

Table 3-1: Major Conservation Lands Near and Adjacent to Fort Belvoir				
Parcel or Property Name	**Land Use, Function, or Primary Management Goal**	**Ownership or Managing Entity**	**Approx. miles*/ bearing from Fort Belvoir**	**Area* (approx. acres)**
Fort Hunt Park (part of the George Washington Memorial Parkway)	Local passive recreation	National Park Service	3.8, N 80° E	240
Lake Accotink Park	Local active and passive recreation	Fairfax County Park Authority	4.8, N 35° W	950
Fort Washington Park	National Historic Site	National Park Service	5.0, East	340

Sources:
- USGS 7.5 minute quadrangles: Fort Belvoir, Virginia – Maryland, 1965; Mount Vernon, Virginia – Maryland,
- 1966; Occoquan, Virginia, 1966
- Fairfax County Section Maps, Revised 1/12/88
- ADC Northern Virginia Street Map Book, 1996
- Street Atlas USA 4.0 Delorme, 1996 * Distances to land holdings are estimated from the point on the Fort

3.3 SUBINSTALLATIONS AND SATELLITE INSTALLATIONS/FACILITIES

3.3.1 Rivanna Station

Fort Belvoir has one subinstallation – the 75-acre Rivanna Station, which is in Albemarle County, approximately 12 miles north of Charlottesville, Virginia. Rivanna Station hosts administrative and associated support facilities for several DoD tenants. It is about 95 miles (driving distance) southwest of Fort Belvoir Main Post. Due to its small size and predominantly developed condition, Rivanna Station will not be covered in detail throughout this INRMP. Instead, it will be addressed separately in Appendix B: Rivanna Station.

3.3.2 Antenna Tower Sites and Outer Marker Site

Fort Belvoir has two antenna tower sites and one outer marker site that together total less than four acres. One tower is located in Fairfax County, Virginia; the other is in Prince Georges County, Maryland. The outer marker site is located in Charles County, Maryland. These three sites consist of structures and maintained turf. Due to their small size and general lack of natural resources, they will not be discussed in detail throughout this INRMP.

3.3.3 Humphreys Engineer Center

The 580-acre Humphreys Engineer Center (HEC) adjoins the northeastern corner of Fort Belvoir Main Post (Figure 3.2). HEC is under the control of the U.S. Army Corps of Engineers. While Fort Belvoir provides specific services to HEC under an Interagency Support Agreement (ISA), HEC is not part of Fort Belvoir and therefore is not covered by this INRMP.

3.3.4 Accotink Village

Accotink Village is a 33-acre unincorporated area along U.S. Route 1. While it is entirely surrounded by Main Post, Accotink Village is not part of Fort Belvoir and therefore not covered by this INRMP.

3.4 INSTALLATION HISTORY

3.4.1 Pre-Military History

According to archaeological records, early humans inhabited the Fort Belvoir region as early as 11,500 years ago. These peoples consisted of the Patawomeke, Piscataway, and Dogue Native American Indian tribes. Historical accounts place

the villages of these tribes spread along the Potomac River where they subsisted on maize, beans, fish, and game. Relationships between the Native Americans and incoming European settlers were friendly in the early years of colonization but deteriorated rapidly as colonial land claims expanded.

In colonial times, the Fort Belvoir region was a part of the vast Northern Neck proprietary between the Potomac and Rappahannock Rivers established in 1649 by Lord Thomas Fairfax. In 1741, his cousin, Colonel William Fairfax, built a spacious manor on the estate and dubbed the home "Belvoir". The manor house was destroyed by fire in 1783 and the rest of the site severely damaged in The War of 1812 (Woolpert, 1993).

3.4.2 Military History

The installation was originally established in 1912, as Camp A.A. Humphreys on a 1,500-acre tract of the estate, to provide training grounds for Army engineers stationed in the Washington Barracks at Fort McNair. On December 23, 1917, Congress approved the official transfer of the US Army Engineer School to the post. The government acquired an additional 4,800 acres (mainly north of U.S. Route 1) through 1920. In 1935, Camp A.A. Humphreys was designated as Fort Belvoir, in honor of the historic Belvoir plantation. The installation trained engineers until June 1, 1988, when the Engineer School was officially moved to Fort Leonard Wood, Missouri. On October 4, 2006, Fort Belvoir was transferred from the MDW to IMCOM. Under the Base Realignment and Closure (BRAC) Act of 1988, Fort Belvoir developed as the principal administrative, housing and logistics center of the US Army in the National Capital Region. Under the BRAC Act of 2005, Fort Belvoir's on-post military/civilian working population increased from 29,978 to more than 40,000.

3.4.3 Land Use

Approximately 65 percent of Fort Belvoir is undeveloped and extensive areas are forested, particularly in the Southwest Area (US Army, 2014), which covers approximately 2,100 acres. Developed areas are found throughout the installation, with the South Post area being the most densely developed area. Open Space is present throughout the developed area; as of 2017, only 16% of the installation is in impervious surface. Table 3-2 outlines current land use acreage throughout Fort Belvoir (Figure 3.4).

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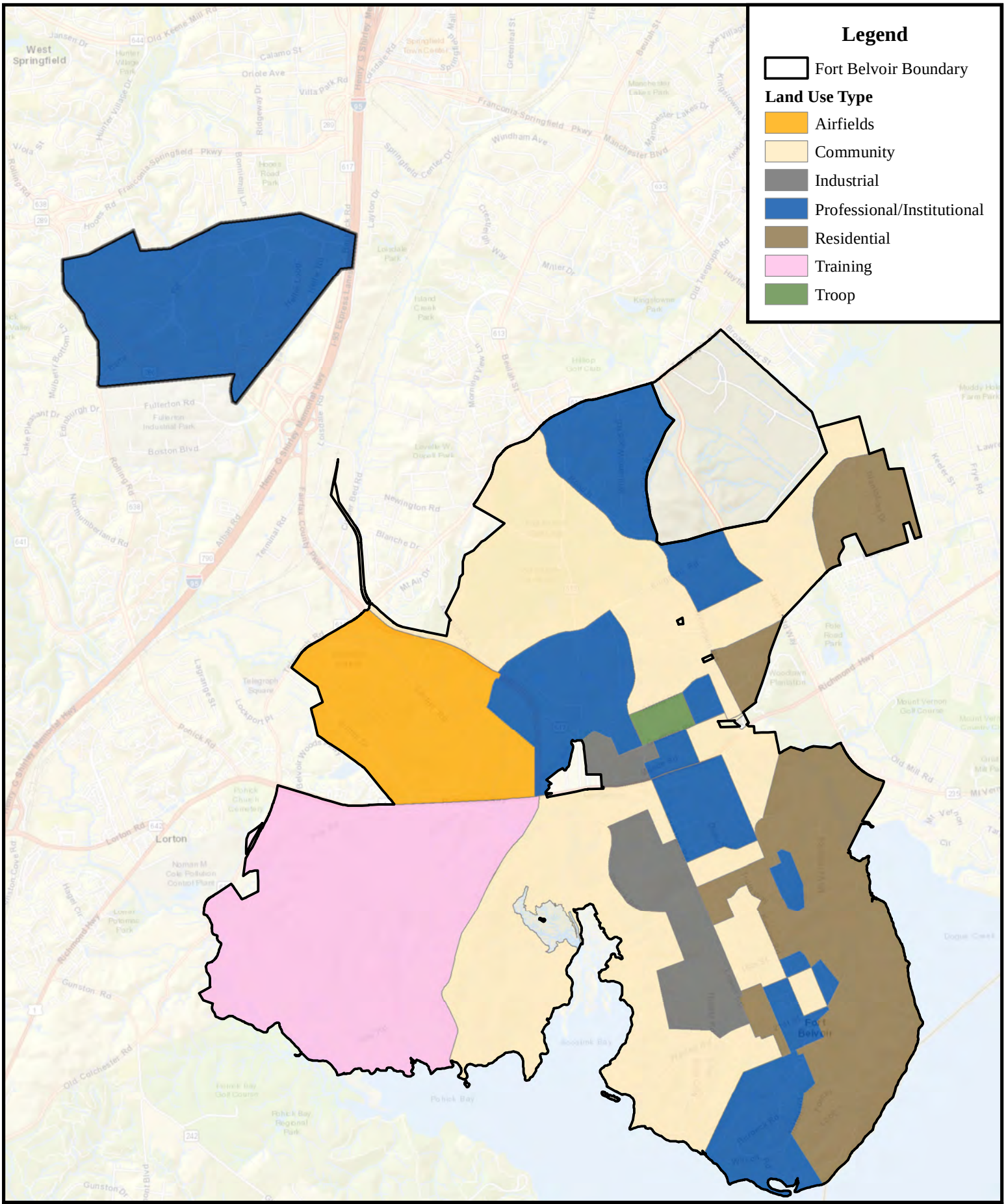

LAND USE ON FORT BELVOIR

Figure 3.4

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Source: Google road maps, Fort Belvoir GIS

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Table 3-2: Existing Land Use			
Land Use Category	**Existing Land Use Acreage**		
	Total	**Constrained**	**Developable**
Professional/ Institutional	2,113	863	1,250
Residential	1,240	655	585
Troop	46	0	46
Community	2,569	1,626	943
Range/ Training	1,463	1,003	460
Airfield	690	472	218
Industrial	378	95	284
TOTAL	8,500	4,714	3,786
TOTAL PERCENTAGES	100	55	45
MAIN POST TOTAL	7,696	4,421	3,275
FBNA TOTAL	804	293	511
Source: U.S. Army, 2014			

Fort Belvoir can be segmented into four subsections: the North Post, South Post, FBNA, and DAAF (Figure 3.2). North Post covers approximately 2,250 acres and is generally bounded by Telegraph Road to the north, Huntley Meadows Park to the east, U.S. Route 1 to the south, and Fairfax County Parkway to the west. North Post is clustered and of moderate to low density; land use is dominated by community, professional/institutional and residential uses. South Post is located south of U.S. Route 1 and occupies approximately 2,550 acres on a peninsula extending into the Potomac River between Gunston Cove and Accotink Bay (to the west) and Dogue Creek (to the east). South Post is the most intensively developed part of Fort Belvoir and is dominated by Residential and Community Uses. FBNA, formerly known as the Engineer Proving Ground (EPG), is an 804-acre noncontiguous portion of the installation located about 1.5 miles northwest of Main Post. Land use on FBNA is classified as Professional/ Institutional. DAAF is located west of North Post within an 800-acre property that is bounded by Fairfax County Parkway to the north and east and U.S. Route 1 to the south.

3.5 HOUSING, BARRACKS, LODGING, AND INFRASTRUCTURE

3.5.1 Housing

Housing on Fort Belvoir was privatized in 2003 under a 50-year lease to Fort Belvoir Residential Communities (FBRC). There are 14 housing villages on post. As of 2018, there are 2,154 homes on post. Upon completion of Dogue Creek Village renovation, the end state will be 2,106 homes. FBRC owns the houses and associated infrastructure within the leased housing areas, and is responsible for their operation and maintenance.

3.5.2 Barracks

Fort Belvoir has barracks serving a maximum of 1,000 permanent party and Warriors in Transition. The barracks are operated and maintained by Fort Belvoir.

3.5.3 Lodging

Lodging on Fort Belvoir was privatized in 2012 under a 50-year lease to Rest Easy, LLC.

3.5.4 Utilities

The following utility systems are on Fort Belvoir:

- potable water
- sanitary sewer
- storm sewer
- electric power
- natural gas, and
- telecommunications

The installation's steam system, once used to heat major facilities on post, has been discontinued.

All of the utility services (with the exception of the storm sewer system which has remained under government ownership and operation) are provided by public or private utility companies operating in the area. Each of these companies maintains a network of major utility corridors, distribution/collection lines, and supporting facilities throughout the installation. Major utility corridors and many of the service lines on post generally require regular maintenance to keep

areas clear of woody vegetation. Utilities in undeveloped installation areas also require trails/roads for routine maintenance and repair access.

3.5.5 Water System

Fort Belvoir purchases its potable water from the Fairfax County Water Authority (Fairfax Water), which operates two water treatment facilities in Fairfax County (the James J. Corbalis Jr. treatment plant at the northern tip of Fairfax County and the Frederick P. Griffith Jr. treatment plant at the southern border of Fairfax County). There are no water treatment facilities, or groundwater wells supplying potable water, on post.

The majority of the water distribution system on post is owned and operated by American Water under a 50-year Utilities Privatization (UP) contract to provide water and wastewater infrastructure services. The remaining portions of the installation's water system are under government control.

As of 2017, there were approximately 46.6 miles of water main (greater than 6-inch pipe), one pumping station, and 3 elevated water storage tanks with a combined capacity of approximately 3 MG on post. Since the award of the UP contract in 2009, American Water has completed a number of projects, including replacement of 39.3 miles of inadequate and leaking water lines, replacement of 3 water storage tanks, and stabilization of three stream crossings.

3.5.6 Sanitary Sewer System

Fort Belvoir purchases sanitary sewer treatment services from Fairfax County's Noman M. Cole Jr. Pollution Control Plant. The Plant is adjacent to the southwestern boundary of Fort Belvoir and discharges to Pohick Creek. There are no sanitary sewer treatment facilities in operation on post. In the past, the installation operated two treatment facilities – one along Dogue Creek and one along Gunston Cove. Treatment operations were discontinued in 1980, and now both facilities are only operated as main pumping stations.

The majority of the sanitary sewer system on post is owned and operated by American Water under the UP contract to provide water and wastewater infrastructure services. The remaining portions of the system remain under government control.

As of 2017, there were 43.6 miles of sanitary sewer main (greater than 6-inch pipe) and 47 sewer lift stations. Separate from American Water's assets, Fort Belvoir owns and operates a septic tank without a septic field at the Golf Course Maintenance Facility on Telegraph Road.

Since the award of the UP contract in 2009, American Water has completed a number of system upgrades, including replacement or relining of 12.7 miles of inadequate/failing sewer pipes, relocation/realignment of utility runs, improvement/upgrade of mechanical systems such as lift stations, installation of system monitoring devices, stabilization of three stream crossings, and elimination of cross-connections.

3.5.7 Storm Sewer System

Fort Belvoir owns and operates the storm sewer system under a Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharges of Stormwater from Small MS4 and a VPDES Individual Industrial Stormwater (ISW) Major Permit. The MS4 Permit (Permit Number VAR040093) covers approximately 7,730 acres of the Garrison and the Individual ISW Major Permit (Permit Number VA0092771) covers approximately 770 acres.

Fort Belvoir incorporates low impact development (LID) best management practices (BMPs) on all projects per Army guidance and has design approval and construction inspection procedures in place to ensure quantity and quality standards established by the Virginia Stormwater Management Program are met. A comprehensive stormwater mapping effort was completed in 2010/2011 by Paciulli, Simmons, and Associates, Ltd (PSA). The study located and assessed over 7,000 stormwater structures ranging from inlets, manholes, outfalls and BMPs. The stormwater conveyance system is covered under the MS4 Phase II permit and consists of a combination of closed and open drainage mostly managed by stormwater BMP controls. Approximately 230 of the 7,000 stormwater features were categorized as stormwater management BMPs. All BMPs are to be inspected annually for maintenance and functionality.

3.5.8 Electric Power System

Fort Belvoir purchases its electricity from Dominion Energy (DE). There are no commercial power generating stations on Fort Belvoir that would be capable of powering the entire post.

As of 2016, the energy distribution system on Fort Belvoir consisted of more than 112 miles of overhead and underground electric line, three switching stations, and one substation. DE also owns and operates medium-sized emergency diesel generators to provide back-up power for critical functions throughout the installation.

Most of Fort Belvoir's electricity distribution system is owned and operated by DE under a 50-year UP services contract. There are portions of Fort Belvoir that are not currently covered under the UP contract, and are fed by the regulated side of DE.

Under the UP contract, DE is responsible for operation and maintenance of the electric distribution system, as well as for making system upgrades. Since the contract was awarded in 2007, DE has completed a number of projects to provide additional capacity, reliability, and resilience to the distribution system. These include undergrounding of existing overhead lines and installation of various equipment upgrades. DE has undergrounded almost 40 miles of overhead facilities since 2007.

3.5.9 Natural Gas System

Fort Belvoir purchases natural gas from Washington Gas Holdings, Inc. (Washington Gas). There are no natural gas production, or storage, facilities on Fort Belvoir.

The natural gas distribution system on Fort Belvoir is owned and operated by Washington Gas under a privatization agreement (December 1998). Washington Gas is responsible for the operation and maintenance of all system appurtenances, including pipes, valves, and header distribution fixtures.
As of 2016, the natural gas distribution system on Fort Belvoir included a network of approximately 120 miles of pipe throughout the installation.

3.5.10 Telecommunications

Telecommunication services on-post are provided by several contracted commercial vendors, including Verizon Federal, under privatized agreements. The system includes overhead and buried transmission lines, duct banks, and other supporting facilities. Maintenance, repair and upgrade of this system is done by the commercial vendors.

3.5.11 Steam System

Fort Belvoir's steam system consisted of three high-pressure steam plants and approximately 13 miles of steam lines, providing steam for heat and hot water to several areas of the post. This system has been phased out, and the above-ground portion of the steam distribution system has been removed.

3.5.12 Transportation System

Fort Belvoir's transportation system consists of roadways, multi-use trails, and a military airfield (DAAF). There is no rail service, or water transportation service, in operation on post.

3.5.13 Roadways

Road access to Fort Belvoir is primarily through six named Access Control Points (Gates) off U.S. Route 1, Farrar Gate (to DAAF only) and Kingman Gate off the Fairfax County Parkway, Telegraph/Beulah Gate off Telegraph Road, and Walker Gate off Old Mount Vernon Highway. A new gate is under construction that will provide access to North Post from U.S Route 1 across from Pence Gate. There are several other unnamed gates, mostly to training areas, throughout the installation. These gates are locked, and accessible only by authorized users.

Access to Fort Belvoir is generally by public highways and major and minor arterial roads (Figure 3.2). Three state-maintained public highways – U.S. Route 1 (6-lane, divided), Fairfax County Parkway (4-lane, divided) and Jeff Todd Way (4-lane, divided) - traverse the installation. Four additional state-maintained public roads – Telegraph Road (4-lane, divided), Pole Road (2-lane), Old Colchester Road (2-lane), and Old Mount Vernon Highway (2-lane) – border the installation.

Installation roads include paved 2- and 4-lane roads through the developed areas and unpaved vehicle trails through the training areas. There are several major bridges in the Fort Belvoir road network including multiple bridges over Dogue and Accotink Creeks, and one over U.S. Route 1. There are numerous smaller bridges and culverts throughout the installation. Fort Belvoir maintains all of the bridges and crossings on the installation. Bridges and crossings on US Route 1, Fairfax County Parkway, and Jeff Todd Way are maintained by the state.

3.5.14 Multi-use and Pedestrian Trails

Fort Belvoir has a network of multi-use trails designed to complement the various roads on post. Improved surface trails parallel many of the roads and developments on post.

3.6 INSTALLATION REVIEW PROCESSES

Fort Belvoir has standard review processes that address site/project planning through project construction. DPW- Environmental Division is a participant in these review processes, which include the following:

- Master planning and sub-area planning
- 1391 development
- Site development planning
- NEPA review
- Report of Availability for real estate actions
- Engineering plan set review

- Work Order review
- Excavation Permit review
- Building Demolition review
- Annual Operations and Maintenance work plan development

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4.0 ENVIRONMENTAL CONDITIONS

4.1 SETTING

Fort Belvoir lies within the Southeastern Plains Ecoregion, based on the EPA's 2013 Level III Ecoregions classification (EPA, 2013). The Southeastern Plains Ecoregion extends from the Gulf of Mexico to southern Maryland, and is composed of irregular, relatively flat plains. In general, long growing seasons and abundant rainfall are paired with relatively poor sandy soils in this ecoregion. Natural forests consist of mixed pine, hickory, and oak. Since the 1980's, natural forest cover has declined significantly throughout this region (Sohl, 2016).

Fort Belvoir is located on the western shore of the Potomac River, approximately 75 miles upstream of the Chesapeake Bay. The installation has more than 12 miles of shoreline, 1,085 acres of wetland areas, and 5,396 acres of forested areas. Fort Belvoir's surrounding local area (metropolitan Washington DC area) and regional area (Chesapeake Bay region) are both experiencing rapid conversions of undeveloped natural areas to developed land uses. Within the metropolitan Washington DC area, Fort Belvoir represents a significant tract of native vegetation in terms of size, diversity, and position relative to the location of off-post tracts of native vegetation. Fort Belvoir has recognized the ecological importance of on-post natural habitats by designating three installation refuges, the two installation corridors, wetlands, and steep-sloped areas as environmentally constrained areas. These large areas of native vegetation afford a contiguous band of wildlife habitat through the installation and provide for connection with wildlife habitat areas outside the installation. Because of this, healthy populations of many common wildlife and plant species, as well as several endangered, threatened and rare species, can be found throughout the installation and its surrounding area.

4.2 CLIMATE PATTERNS

Virginia is classified as a "Moist Mid-Latitude Climate", subtype "Humid Subtropical" (Cfa) by the Köppen Climate Classification System. This climate subtype is characterized by mild winters and warm, humid summers, and an absence of an annual dry season. During winter, freezes occur, but do not persist for long periods. During summer, warm and wet flows from the tropics result in muggy conditions and frequent thunderstorms.

The most recent (1981–2010) "Climate Normals" reported by the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) weather station at Washington Reagan National Airport (DCA), located approximately 11 miles north-east of Fort Belvoir) show the warmest months of

the year to be June, July and August with average maximum temperatures of 84.2, 88.4 and 86.5, respectively, and the coolest months of the year to be January, February and December with average minimum temperatures of 28.6, 30.9 and 32.5, respectively (Table 4-1). The Climate Normals show precipitation to be fairly evenly distributed throughout the year, ranging from a monthly average low of 2.62 inches in February to a monthly average high of 3.99 inches in May, for monthly average of 3.3 inches. (NOAA, 2017).

Table 4-1: 1981-2010 Climate Normals

Month	Precipitation (inches)	Minimum Temperature	Average Temperature	Maximum Temperature
January	2.81	28.6	36.0	43.4
February	2.62	30.9	39.0	47.1
March	3.48	37.6	46.8	55.9
April	3.06	47.0	56.8	66.6
May	3.99	56.5	66.0	75.4
June	3.78	66.3	75.2	84.2
July	3.73	71.1	79.8	88.4
August	2.93	69.7	78.1	86.5
September	3.72	62.4	71.0	79.5
October	3.17	41.2	49.6	57.9
November	3.17	41.2	49.6	57.9
December	3.05	32.5	39.7	46.8

Source: NOAA, 2010

Fort Belvoir is within the USDA Plant Hardiness Zone 7, an area where the expected minimum winter temperature is between 0 to 10 degrees Fahrenheit (USDA, 2017). The first and last frosts of the year for the Fort Belvoir area most commonly occur around October 15 and April 22, respectively.

Storm systems generally move from west to east across the State, but may also approach from the southwest paralleling the coast and the Gulf Stream. This shift to a northeast track results in part from the tendency of storms to follow frontal boundaries between the cold land air mass and the warm Gulf Stream water. Storms may grow rapidly as they cross the coast, and as they move northeastwards moisture-laden air from the storm crosses Virginia from the east and northeast. Precipitation from these storms tends to be greater in the mountain areas than in the eastern part of Virginia (UVA, 2017).

More information on Virginia's climate and weather may be found on the University of Virginia Climatology Office website, the Southeast Regional Climate Center (University of North Carolina Chapel Hill) and the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) websites.

4.3 AIR QUALITY

The Clean Air Act (CAA) addresses ambient air quality in terms of six (6) criteria pollutants and requires the USEPA to establish National Ambient Air Quality Standards (NAAQS) for acceptable concentrations of these pollutants Table 4-2.

Table 4-2: National Ambient Air Quality Standards

Pollutant	Standard	Averaging Time	Ambient Concentration
CO	Primary	1-hour[a] (ppm)	35
		8-hour[a] (ppm)	9
NO_2	Primary	1-hour[b] (ppm)	100
	Primary and Secondary	Annual[c] (ppm)	53
O_3	Primary and Secondary	8-hour[d](ppm)	0.075
SO_2	Primary	1-hour[e] (ppb)	75
	Secondary	3-hour[a] (ppm)	0.5
$PM_{2.5}$	Primary and Secondary	24-hour[f] ($\mu g/m^3$)	35
	Primary	Annual arithmetic mean[g] ($\mu g/m^3$)	12
	Secondary	Annual arithmetic mean[g] ($\mu g/m^3$)	15
PM_{10}	Primary and Secondary	24-Hour[h] ($\mu g/m^3$)	150

Source: 40 CFR 50.1-50.12; USEPA, 2015
CO = carbon monoxide; $\mu g/m_3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; O_3 = ozone; ppb = parts per billion; ppm = parts per million; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_2 = sulfur dioxide
a Not to be exceeded more than once per year.
b 98th percentile, averaged over 3 years.
c Annual mean.
d The 3-year average of the fourth highest daily maximum 8-hour average O_3 concentrations over each year must not exceed 0.08 ppm.
e The 3-year average of the 99th percentile of 1-hour daily maximum concentrations.
f The 3-year average of the 98th percentile of 24-hour concentrations.
g The 3-year average of the weighted annual mean.
h Not to be exceeded more than once per year, on average over 3 years.

The USEPA classifies areas as "attainment" (meeting the NAAQS) or "nonattainment" (not meeting the NAAQS), and designates "Air Quality Control Regions" (ACQRs) for areas that do not meet NAAQS (i.e., areas that are nonattainment for at least one of the criteria pollutants). Fort Belvoir is located within the designated "National Capital Interstate Air Quality Control Region",

which is comprised of the District of Columbia, portions of Maryland and Virginia. As of 2018 this Region is classified as

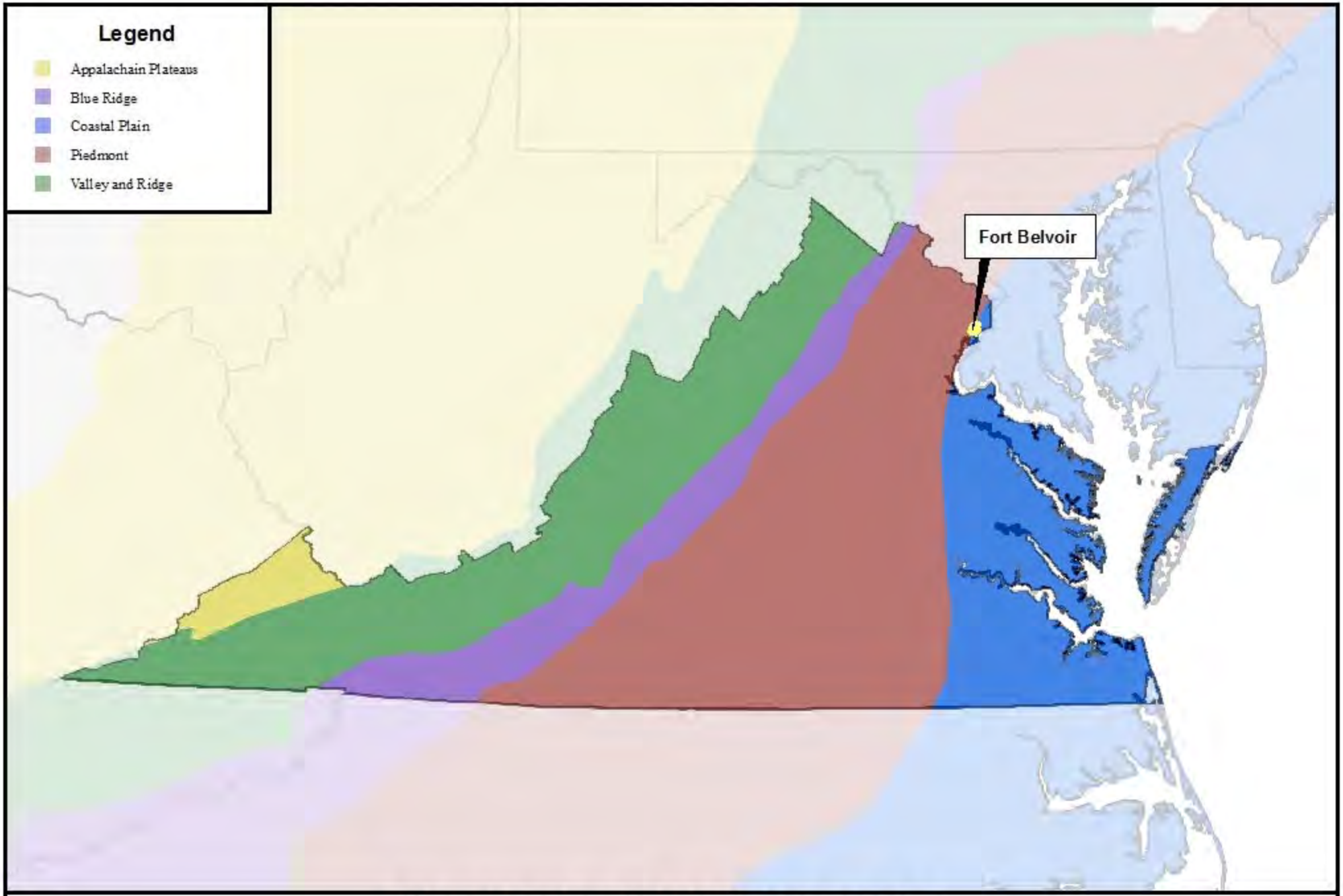
- Marginal nonattainment for the 2008 8-hour O_3 NAAQS
- Moderate nonattainment for the 1997 8-hour O_3 NAAQS
- Nonattainment for the 1997 $PM_{2.5}$ NAAQS
- Attainment for all other criteria pollutants

The CAA authorizes the USEPA to delegate NAAQS enforcement down to the states. In Virginia, this authority has been delegated to the Virginia Department of Environmental Quality (VDEQ). As required by the CAA, the VDEQ has a federally approved State Implementation Plan (SIP) showing how the state plans to reduce and maintain criteria pollutants at or below NAAQS. More information on the Virginia SIP and Virginia's air quality programs can be found on the VDEQ website.

4.4 PHYSIOGRAPHY AND TOPOGRAPHY

The Commonwealth of Virginia spans five physiographic provinces. These provinces transition from high elevations with rugged terrains and interspersed valleys in the western part of the state, to broad rolling hills with decreasing elevations and less-rugged terrain in the central part of the state, to broad, flat, low areas of the coastal plain in the eastern part of the state (Figure 4.1). Waterways exhibit similarly varied characteristics, transitioning from defined channels with steep gradients and fast flows in the west, to wide, meandering channels with slow flows in the east. (VDEQ website, Physiographic Provinces of Virginia, 2016).

The terrain at Fort Belvoir consists of wide, flat plateaus dissected by steep ravines. Elevation decreases from west to east, ranging from a high of 300 feet above mean sea level (MSL) in the northwestern corner of the North Area to 230 feet above MSL at the intersection of Beulah Street and Woodlawn Road near the northern edge of Main Post, to sea level at the eastern edge of Main Post along the Potomac River (Figure 4.2).



PHYSIOGRAPHIC PROVINCES of VIRGINIA

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Figure 4.1

Source: Virginia Tech Digital Atlas of Virginia

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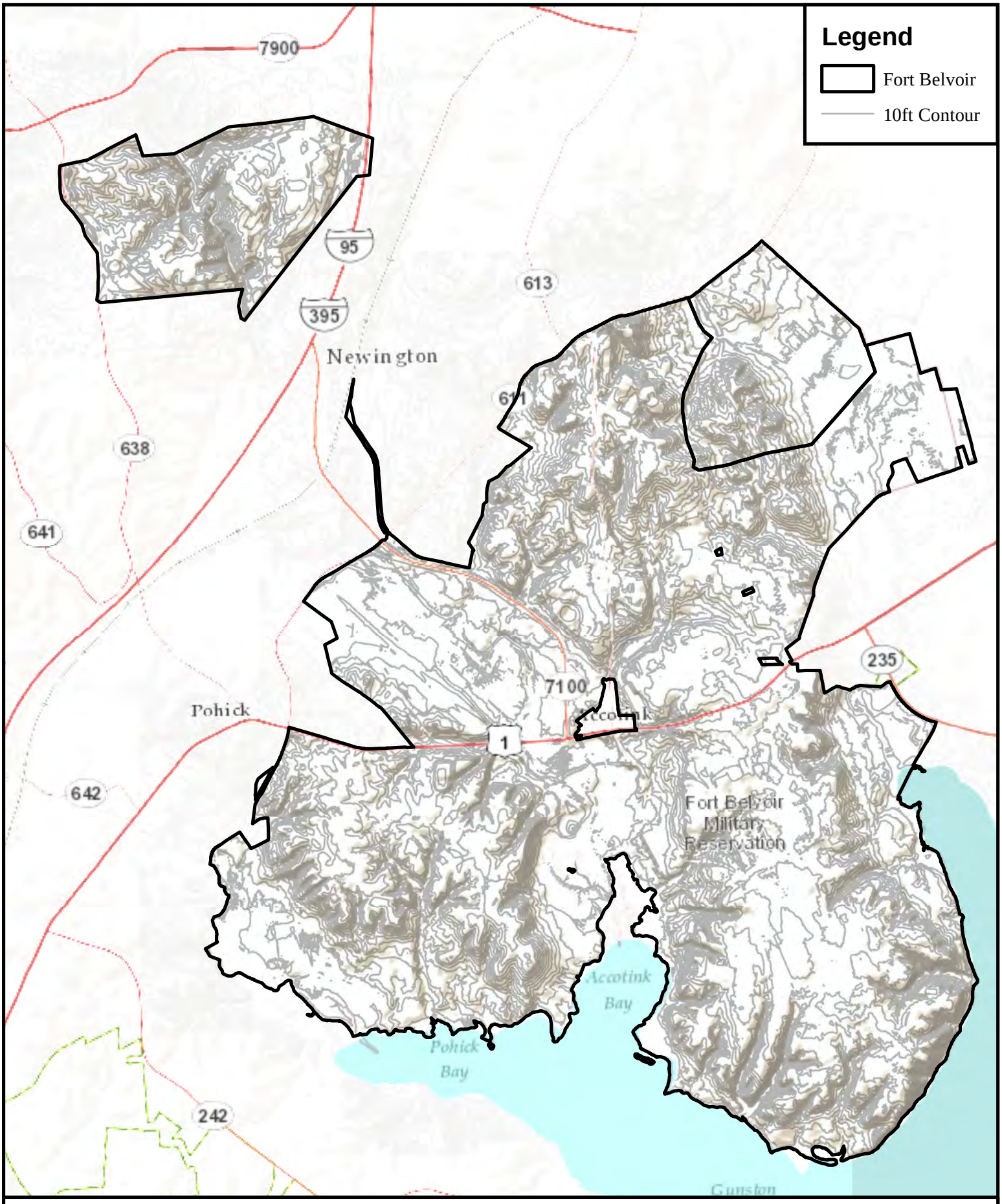

1 inch = 0.7 miles

0 0.225 0.45 0.9 Miles

TOPOGRAPHY ON FORT BELVOIR

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Figure 4.2

Source: ESRI basemap, Fort Belvoir GIS

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4.5 GEOLOGY

Fort Belvoir spans the eastern part of the Piedmont Province and the upper part of the Coastal Plain Province (from west to east), and as such exhibits characteristics of both provinces. The Fall Line, which runs north to south through Virginia, crossing Fairfax County at approximately the I-95 corridor, forms the transition zone between the resistant, igneous and metamorphic rock of the Piedmont and the softer, sedimentary rocks of the Coastal Plain.

A finger of Piedmont Upland province bedrock extends from north to south along Accotink Creek. Piedmont Upland bedrock outcrops form the bed and adjacent slopes of the creek. Most of the more gently sloping areas to the east and west of the creek consist of unconsolidated deposits from the Coastal Plain Province (USATHAMA, 1990).

The southern and central portions of Fort Belvoir are situated on the Coastal Plain Physiographic Province, which is comprised of several geologic formations, including the Potomac Formation, Bacons Castle Formation, Shirley Formation, and Alluvium and Pliocene sand and gravel. These formations are characterized by unconsolidated sand, silt, and clay underlain by residual soil and weathered crystalline rocks. The Potomac Group, which makes up the majority of the Coastal Plain Physiographic Province under Fort Belvoir, is characterized by lens-shaped deposits of interbedded sand, silt, clay, and gravel, primarily of non-marine origin (USATHAMA, 1990).

The northern portion of Fort Belvoir is situated on the Piedmont Plateau Physiographic Province. The underlying geology of this Province is characterized by hard, crystalline igneous and metamorphic formations with some areas of sedimentary rocks, with sapprolite deposits overlying the bedrock (VDEQ, 2016).

4.6 GEOMORPHOLOGY

Fort Belvoir's uplands are underlain by sands, silts and clays of riverine origin. Uplands underlain by sands and silts tend to be more stable than those underlain by clays. Uplands that are underlain by clayey soils form undulating and rolling hills, and the dominant geomorphic process in the clayed areas is mass wasting – including downhill creep, landslides, slumping and rockfalls.

Lowlands and valley bottoms are typically underlain with alluvium. The dominant geomorphic process is active riverine erosion and deposition during overbank flooding. Surface drainage is commonly poor due to the shallow water table.

The dominant geomorphic process in the sloping valley sides is gravitational mass wasting. This includes downhill creep, landslides, slumping and rockfalls.

Drainage usually occurs as surface runoff, with runoff greatest on the steeper slopes and increasing with construction activity and the removal of vegetation, which greatly increases the rate of erosion and the probability of creep and slumping.

4.7 SOIL

A soil resource report was compiled by the online web soil survey provided by the Natural Resource Conservation Service (NRCS) for Fort Belvoir Main Post in July 2016. Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (NRCS, 2006). There are twenty-six soil types present at Fort Belvoir Main Post. Of the area included in the survey, 1,813 acres are described as urban built-up, which represents 22.2% of the soil on Fort Belvoir. The urban built-up unit includes primarily ridge top or other well-drained flatter areas that have been minimally to drastically disturbed by construction and development over the years. Areas within the urban built-up unit that are not under buildings or paving are vegetated, generally with lawn and landscape trees and shrubs. The most abundant native soils on post include Beltsville silt loam (875.1 acres) and Sassafras-Marumsco complex (753.6 acres). Tables 4-3 and 4-4 list the soils mapped within Fort Belvoir Main Post and FBNA, respectively, along with some selected features.

Table 4-3: Soils within Fort Belvoir			
Map Unit Symbol	**Map Unit Name**	**Approximate Acres in Fort Belvoir**	**Approximate Percent within Fort Belvoir**
7B	Beltsville silt loam, 2 to 7 percent slopes	875.1	10.7%
29A	Codorus silt loam, 0 to 2 percent slopes, occasionally flooded	40.7	0.5%
30A	Codorus and Hatboro soils, 0 to 2 percent slopes, occasionally flooded	492.6	6.0%
33A	Downer loamy sand, 0 to 2 percent slopes	59.0	0.7%
36A	Elkton silt loam, 0 to 2 percent slopes, occasionally ponded	81.6	1.0%
40	Grist Mill sandy loam, 0 to 25 percent slopes	408.7	5.0%
46B	Grist Mill-Mattapex complex, 2 to 7 percent slopes	0.5	0.0%
48A	Gunston silt loam, 0 to 2 percent slopes	636.2	7.8%
49A	Hatboro silt loam, 0 to 2 percent slopes, frequently flooded	271.5	3.3%
60A	Honga peat, 0 to 1 percent slopes, very frequently flooded, tidal	59.0	0.7%
66	Kingstowne sandy clay loam, 0 to 45 percent slopes	0.9	0.0%
71C	Kingstowne-Sassafras-Marumsco complex, 7 to 15 percent slopes	1.4	0.0%
72B	Kingstowne-Sassafras-Neabsco complex, 2 to 7 percent slopes	6.1	0.1%
74B	Lunt-Marumsco complex, 2 to 7 percent slopes	108.1	1.3%
76B	Matapeake silt loam, 2 to 7 percent slopes	213.4	2.6%
77A	Mattapex loam, 0 to 2 percent slopes	78.3	1.0%
77B	Mattapex loam, 2 to 7 percent slopes	364.7	4.5%
86	Pits, gravel	18.0	0.2%
90A	Sassafras sandy loam, 0 to 2 percent slopes	7.5	0.1%
90B	Sassafras sandy loam, 2 to 7 percent slopes	113.9	1.4%
90C	Sassafras sandy loam, 7 to 15 percent slopes	143.2	1.8%
91C	Sassafras-Marumsco complex, 7 to 15 percent slopes	634.7	7.8%
91D	Sassafras-Marumsco complex, 15 to 25 percent slopes	753.6	9.2%
91E	Sassafras-Marumsco complex, 25 to 45 percent slopes	512.2	6.3%
95	Urban land	1,813.5	22.2%
109B	Woodstown sandy loam, 2 to 7 percent slopes	432.3	5.3%

Table 4-3: Soils within Fort Belvoir			
Map Unit Symbol	**Map Unit Name**	**Approximate Acres in Fort Belvoir**	**Approximate Percent within Fort Belvoir**
W	Water	52.0	0.6%
Subtotals for Soil Survey Area		**8,178.7**	**100.0%**
Totals for Area of Interest		**8,178.7**	**100.0%**

Source: USDA, 2016

Soils on FBNA were surveyed by the Natural Resources Conservation Service from 2002 to 2008. A digital soil survey documented twenty eight separate soil types within the North Area of Fort Belvoir (USDA, 2016) The predominant soil types surveyed, which collectively cover the majority of North Area are Beltsville silt loam (21.8%), Kingstown sandy clay loam (19.4%), and Rhodhiss sandy loam (11.4%).

Table 4-4: Soils within North Area Fort Belvoir			
Map Unit Symbol	**Map Unit Name**	**Approximate Acres in Fort Belvoir**	**Approximate Percent within Fort Belvoir**
4B	Barkers Crossroads-Nathalie complex, 2 to 7 percent slopes	0.5	0.1%
5C	Barkers Crossroads-Rhodhiss complex, 7 to 15 percent slopes	0.1	0.0%
7B	Beltsville silt loam, 2 to 7 percent slopes	174.4	21.8%
30A	Codorus and Hatboro soils, 0 to 2 percent slopes, occasionally flooded	16.6	2.1%
38B	Fairfax loam, 2 to 7 percent slopes	3.4	0.4%
39B	Glenelg silt loam, 2 to 7 percent slopes	21.8	2.7%
39C	Glenelg silt loam, 7 to 15 percent slopes	11.	1.5%
66	Kingstowne sandy clay loam, 0 to 45 percent slopes	154.8	19.4%
70C	Kingstowne-Sassfras complex, 7 to 15 percent slopes	0.1	0.0%
71C	Kingstowne-Sassafras-Marumsco complex, 7 to 15 percent slopes	0.0	0.0%
72B	Kingstowne-Sassafras-Neabsco complex, 2 to 7 percent slopes	0.1	0.0%

Table 4-4: Soils within North Area Fort Belvoir			
Map Unit Symbol	**Map Unit Name**	**Approximate Acres in Fort Belvoir**	**Approximate Percent within Fort Belvoir**
76B	Matapeake silt loam, 2 to 7 percent slopes	1.7	0.2%
78B	Meadowville loam, 2 to 7 percent slopes	1.8	0.2%
79B	Nathalie gravelly loam, 2 to 7 percent slopes	18.1	2.3%
79C	Nathalie gravelly loam, 7 to 15 percent slopes	37.5	4.7%
79D	Nathalie gravelly loam, 15 to 25 percent slopes	9.8	1.2%
86	Pits, gravel	5.9	0.7%
87C	Rhodhiss sandy loam, 7 to 15 percent slopes	4.3	0.5%
87D	Rhodhiss sandy loam, 15 to 25 percent slopes	38.4	4.8%
87E	Rhodhiss sandy loam, 25 to 45 percent slopes	91.3	11.4%
88E	Rhodhiss-Rock outcrop complex, 25 to 45 percent slopes	0.0	0.0%
90B	Sassafras sandy loam, 2 to 7 percent slopes	10.1	1.3%
90C	Sassafras sandy loam, 7 to 15 percent slopes	25.5	3.2%
91C	Sassafras-Marumsco complex, 7 to 15 percent slopes	75.4	9.4%
91D	Sassafras-Marumsco complex, 15 to 25 percent slopes	48.9	6.1%
91E	Sassafras-Marumsco complex, 25 to 45 percent slopes	11.2	1.4%
92B	Sassafras-Neabsco complex, 2 to 7 percent slopes	0.5	0.1%
95	Urban land	34.1	4.3%
Totals for Area of Interest		**798.3**	**100.0%**

Source: USDA, 2016

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5.0 WATER RESOURCES

The DoD recognizes that its water resources play a multi-faceted role in maintaining military readiness, quality of life, and ecosystem integrity. Water resources such as streams and wetlands, referred to as waters of the U.S. (WOUS), perform numerous functions important to maintaining environmental quality of natural and cultural resources. Healthy water resources, such as wetlands and streams, supply essential habitat for unique plant communities, fish, and wildlife species. They improve environmental quality and resilience by moderating flood flows, mitigating storm surges, protecting against erosion, improving water quality, enhancing groundwater recharge, performing stream flow maintenance, supporting the global cycling of nutrients (available nitrogen and phosphorus), and sequestering greenhouse gases (especially carbon dioxide and methane). Additionally, water resources provide aesthetic, cultural, and recreational value while supplying realistic training conditions for field exercises. Therefore, the DoD utilizes its water resources to its benefit in order to meet the military mission and enhance the quality of life for soldiers.

Fort Belvoir is located within the Lower Potomac River watershed, a sub-watershed of the greater Chesapeake Bay watershed (Figure 5.1). Most water resources found in this region exhibit characteristics of the upper Coastal Plain and lower Piedmont, with resources typically occurring within a drainage network. The larger tributaries of the Potomac River found at Fort Belvoir - the Accotink Creek, Dogue Creek, and Pohick Creek - tend to have wide areas of tidal wetlands (marsh and mudflats) at their outfalls. Upstream from the mouths of these tributaries, the marsh wetland habitats transition to a floodplain/bottomland hardwood forest ecosystem within a riparian zone. This forested area tends to be wider in the lower reaches, where the tidally influenced floodplain spreads over the wide and low topography, and diminishes in extent further upstream concurrent with the narrowing of the floodplain. This narrowing of the floodplain results in a concentration of numerous water resources. Further upstream, smaller headwater streams and seeps occur.

As the largest estuary in the United States, the Chesapeake Bay is a complex ecosystem with various types of water resources and associative communities. Over the last 200 years, the Chesapeake Bay watershed has been and continues to be degraded by:

- Ditching and filling of wetlands for agriculture and development
- Constructed impoundments converting streams to manmade lakes/ponds
- Dredging and channelization of streams for drainage, flood control and navigation

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CHESAPEAKE BAY WATERSHED

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Figure 5.1

Source: Chesapeake Bay Foundation, HUC8 USGS Watersheds, Fort Belvoir GIS

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- Disposal of dredged material in wetlands and waterways
- Logging, mining, and overgrazing by domestic animals
- Agricultural runoff containing contaminants from pesticides and herbicides
- Urban and industrial pollutants, air contaminants, and toxic chemicals
- Invasive species infestations
- Inadequate management of stormwater runoff from impervious surfaces and cleared lands
- Excess nutrients from agricultural and urban lands causing eutrophication
- Dams, culverts, and other structures blocking movement of aquatic life in waterways

Degraded water resources are vulnerable to further damage from natural processes that would otherwise generally not be harmful. Sea-level rise, droughts, flooding, and hurricanes and other large storm events can cause substantial erosion of sediments and material contributing to the degradation and loss of these ecosystems already impacted by human action.

Improper management of water resources can have far-reaching ecosystem effects. Inadequately managed stormwater runoff and water pollution can cause the loss of fish and wildlife populations via habitat degradation and increased problems with diseases. Local drought and storm conditions are likely to become more severe, exacerbating the effects of improper water resource management. The resulting increases in riverine and coastal flood severity pose additional risk of serious ecosystem damage. Therefore, the DoD recognizes the value of maintaining sustainable water resources to prevent such impacts and to meet the military mission. The DoD is committed to the minimization of impacts to and no net loss of such resources on its lands in order to achieve the military mission.

Fort Belvoir follows all required federal and state water resource laws in order to maintain and improve these vital resources. The DoD's water resources can be used in a variety of ways, such as for amphibious training, water purification training, recreation, and as a drinking water supply. Fort Belvoir is working to maintain and improve on-post water resources by implementing a watershed-based approach to planning management and by meeting regulatory requirements to preserve, protect, and enhance its water resources.

5.1 WATER RESOURCE POLICIES

5.1.1 Federal Water Resources Policy

- ***Clean Water Act (CWA) (33 CFR Part 320-350, 40 CFR Part 230, 33 USC §401-§1413)***
  The CWA is the primary federal law that regulates water resources and establishes a national commitment to restore and maintain the chemical, physical, and biological integrity of the nation's water. This has been accomplished by implementing pollution control programs and setting water quality standards for contaminants in surface waters. The regulatory authority for CWA activities rests with USACE and the USEPA. Implementation of the CWA involves permitting and compliance monitoring of water pollution which directly impacts water resources, such as the placement of dredge or fill material into wetlands, lakes, streams and rivers; stormwater pollution; industrial stormwater pollution; waste water; industrial wastewater; aquaculture; and oil spills and spill prevention.

- ***Coastal Zone Management Act (CZMA) (16 USC §1452, et seq. most recently amended through the Coastal Management Enhancement Act of 1999)***
  The CZMA's goal is to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone (§1452[1]), including wetlands, floodplains, estuaries, fish and wildlife, and their habitats. The National Oceanic and Atmospheric Administration (NOAA) administers this program nationally, and the states administer the CZMA under their own programs with each state designating a lead agency. In Virginia, this program is known as the Virginia Coastal Zone Management Program (CZMP), and the Virginia Department of Environmental Quality (VDEQ) serves as the lead agency. The CZMP is a network of Virginia State agencies and local governments which administer enforceable laws and regulations to protect coastal resources and promote sustainable development. Together, NOAA, VDEQ, and their partners establish the designated coastal zone for Virginia, which covers 29 percent of Virginia and includes all of Virginia's Atlantic coast watershed, the Chesapeake Bay, and four tidal rivers reaching as far as 100 miles inland (James, York, Rappahannock, and Potomac Rivers). The program focuses on problems associated with, but not exclusively limited to, fisheries management, subaqueous lands management, wetlands management, dunes management, non-point source pollution control, shoreline sanitation, air pollution control, and coastal lands management.

- ***The Sikes Act (16 USC Section 670a, et seq.) as amended in the Sikes Act Improvement Act of 1997***
- ***North American Wetlands Conservation (16 USC §4408)***

- ***The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701 et seq.)***
- ***Wetlands Resources (16 USC §3901)***
- ***The American Heritage Rivers Initiative of 1997***
- ***The Chesapeake Bay Restoration Act of 2000***
- ***Executive Order 11988 – Floodplain Management (Fed. Reg. 26951)***
- ***Executive Order 11990 – Protection of Wetlands (Fed. Reg. 26961)***
- ***Executive Order 13508 – Chesapeake Bay Protection and Restoration (Fed. Reg. 23099)***
- ***Executive Order 13693 – Planning for Federal Sustainability in the Next Decade (80 Fed. Reg. 15871)***
- ***Safe Drinking Water Act (16 USC Sec. 300f et seq.)***
- ***Energy Independence Security Act (42 USC Sec. 17094)***
- ***Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (65 Fed. Reg. 62565-62572)***
- ***The 2014 Chesapeake Bay Watershed Agreement***

5.1.2 State Water Resources Policy

- ***Virginia Water Control Law (Virginia Code §62.1-44.2)***
  The Virginia Water Control Law is a comprehensive policy protecting the waters of Virginia. The Virginia Department of Environmental Quality (VDEQ) was given regulatory authority under this law, as well as the Virginia Water Protection Permit Program Regulation (9 VAC 25-210) and the Virginia Pollution Discharge Elimination System (VPDES) Permit Program Regulation (9 VAC 25-31), to protect various components of water resources.
  Subaqueous Guidelines, Constitution of Virginia (Title 28.2, Chapter 12) Tidal waters in Virginia are regulated by the Virginia Marine Resources Commission (VMRC). The VMRC operates under the mandates of the Virginia Wetlands and Subaqueous Laws under the Code of Virginia, Title 28.2, Chapter 12-1200. All the beds, bays, rivers, creeks, and the shores of the sea within Jurisdiction of the Commonwealth, not conveyed by special grant or compact according to the law shall remain the property of the Commonwealth. As such, submerged lands, to include wetlands are regulated by the Commonwealth to prevent the despoliation and destruction within its jurisdiction while accommodating necessary economic development.
- ***Chesapeake Bay Program (CBP)***
  The CBP, established in 1983, is a cooperative, voluntary program comprised of various federal, state, and local agencies working towards the restoration and protection of the Chesapeake Bay. Since its inception, the program has evolved through numerous agreements, directives, and policies.

Executive Order 13508 from 2009 declared the Chesapeake Bay a national treasure and required the federal government to take action and accountability to help meet the goals of the CBP. The Army has established five strategy goals.

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.

This agreement effectively guides development of a watershed-based approach for natural resources management that promotes the goals of the CBP.

- ***Chesapeake Bay Preservation Areas (9 VAC 25-830-50)***
  Under this regulation, any locality found within Tidewater Virginia is required to maintain a vegetative buffer no less that than 100 feet wide located adjacent to and landward of all tidal shores, tidal wetlands, and non-tidal wetlands connected by surface flow and contiguous to tidal wetlands along water bodies with perennial flow. Fort Belvoir also applies a 35 foot buffer for all intermittent streams. These areas are known as Resource Protection Areas (RPAs).

- ***Virginia Pollutant Discharge Elimination System (VPDES) Permits***
  Fort Belvoir's stormwater system is governed under two separate VPDES permits: a General Permit for Discharge of Stormwater from a Municipal Separate Storm Sewer System (MS4) and an Industrial Stormwater (ISW) Individual Major Permit.

- ***Chesapeake Bay Preservation Act (Virginia Code §10.1-2100 et seq.)***
- ***Virginia Water Protection Regulations (9 VAC 25-210)***
- ***Virginia Water Quality Standards (9 VAC 25-260)***
- ***Authority to enact the Virginia Water Protection permit (Virginia Code §62.1-44.15:20)***
- ***Virginia Water Quality Improvement Act (Virginia Code §10.1-2117 through 2134)***
- ***Virginia Water Protection Regulations (Virginia Regulations, VR 680-15-02)***
- ***Virginia Stormwater Management Act (Virginia Code §62.1-44.15 through 44.30)***

- ***Surface Water Management Act of 1989 (Virginia Code §62.1-242 et seq.)***
- ***Virginia Water Protection Permit (Section 401 certification)***
- ***Virginia Water Protection Permit (Virginia Code §62.1-44.15:5)***
- ***Virginia Chesapeake Bay Preservation Act (CBPA, Virginia Code §§ 62.1-44.15:67 through 62.1-44.15:79)***

5.1.3 Department of Defense Water Resources Policy

- ***Natural Resources Conservation Program (DoDI 4715.03)***
  DoD's natural resources management policy and instruction requires installations to follow an ecosystem-based approach using adaptive management of natural resources, to inventory and protect important biological resources, and promote biodiversity while being able to provide continued access to installation air, water and land for realistic military training and testing. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education, and scientific research and study, compatible with the installation's ecosystem management goals, and military mission. Excerpts from DoDI 4715.03 that are applicable to water resources management are presented below.

Excerpts from DoDI 4715.03 Select Provisions Applicable to Water Resources
• The principle purpose of DoD lands, water, 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, in accordance with 16 USC Section 670a-670o. • DoD shall demonstrate stewardship of natural resources in its trust by protecting and enhancing those resources for mission support, biodiversity conservation, and maintenance of ecosystem services. • DoD Components shall ensure no net loss of size, function, and value of wetlands, and will preserve the natural and beneficial values of wetlands in carrying out activities in accordance with E.O. 11990 and the White House Office on Environmental Policy (Reference (ah)). • DoD shall manage DoD lands, waters, airspace, and coastal resources or natural resources for multiple uses when appropriate, including sustainable yield of all renewable resources, scientific research, education, and recreation. • All DoD facilities and installations shall plan, program, and budget to achieve, monitor, and maintain compliance with all applicable Federal natural resources statutory and regulatory requirements, E.O.s, and Presidential memorandums.

Excerpts from DoDI 4715.03
Select Provisions Applicable to Water Resources

- DoD shall follow an ecosystem-based management approach to natural resources-related practices and decisions, using scientifically sound conservation procedures, techniques, and data.
- DoD Components shall use a watershed-based approach to manage operations, activities, and lands to avoid or minimize impacts to wetlands, ground water, and surface waters on or adjacent to installations in accordance with the guidelines and goals established in the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, pages 62565 through 62572 of volume 65, FR (Reference (ae)) and E.O. 13508 (Reference 9af)).
- When avoidance of wetlands and other waters of the United States is not practicable, and impacts have been minimized, participation in an approved off-site mitigation bank or in-lieu fee instrument is encouraged as sound conservation planning and is authorized by section 2694b of Reference (v). Offsite mitigation may provide a preferred alternative to meet watershed protection and ecosystem goals and meet future mission requirements. The enhancement, creation, or restoration of wetlands or streams on DoD property may also be an acceptable means for mitigating mission impacts on wetlands to meet permit conditions as required by 33 USC Section 1344.(Reference (ai)).
- In the event that discharges of pollutants into wetlands or other U.S. waters are necessary, DoD Components will ensure appropriate permits are obtained and mitigation completed as required by Section 1344.
- DoD Components shall comply with applicable nonpoint source laws respecting the control and abatement of water pollution in accordance with 1323 of Reference (ai). DoD shall incorporate the best management practices for runoff for the State in which the installation is located to minimize nonpoint sources of water pollution.
- Adverse impacts on floodplains shall be avoided when possible. The direct or indirect support of floodplain development shall be avoided where there is a practicable alternative in accordance with E.O. 11988 (Reference (aj)).
- DoD installations shall complete planning-level surveys, as defined in the DoDI 4715.03 glossary, to characterize significant installation resources.
- Areas on DoD installations that contain natural resources (e.g., ecological, scenic, recreational, or educational) that warrant special conservation efforts may be designated as Special Natural Areas where such conservation is consistent with the military mission.
- DoD shall, as practicable, manage its operations, activities, and natural resources to avoid or minimize adverse effects to natural resources on, adjacent to, or in close proximity to DoD lands or near-shore areas.

5.1.4 Department of the Army Water Resources Policy

- ***Environmental Protection and Enhancement (AR 200-1)***
  The Army's natural resources management policy is contained within AR 200-1, Environmental Protection and Enhancement. This regulation establishes the Army's requirements for complying with applicable Federal, State, and local laws and regulations regarding, but not limited to, water resources management. This regulation is used for preserving, protecting, conserving, and restoring the quality of the environment. This regulation supports the Army Strategy for the Environment, which presents the Army's environmental vision as sustainable operations, installations, systems, and communities enabling the Army mission. AR 200-1 addresses recreational waters, water resource protection and management, watershed management, wastewater and storm water, and drinking water. AR 200-1 also addresses sediment and erosion control, federal actions in or affecting a coastal zone, the protection of aquatic resources, and access to water areas suitable for recreational use. Excerpts from AR 200-1 that are applicable to water resources management are presented below.

Excerpts from AR 200-1 Sections Applicable to Water Resources
• [The Army will] obtain and comply with all required Federal, State, and local Clean Water Act (CWA), Coastal Zone Management Act (CZMA), and Safe Drinking Water Act (SDWA) permits (includes wastewater and storm water permits, operational permits for drinking water systems, groundwater discharge permits, wetland 404/401 permits, septic system permits, underground injection control, and so forth). • All Army organizations and activities will comply with legally applicable Federal, State, and local regulations, E.O.s, and FGS to conserve, protect and restore surface water resources (including wetlands, estuaries, streams, lakes and so forth), and groundwater (wells and aquifers). • Executive Order 11988 addresses the action federal agencies take to identify and protect flood plains and wetlands, respectively. • Executive Order 11990 addresses the actions federal agencies take to identify, protect, and initiate action to enhance wetlands natural values. • The CZMA requires that activities within the coastal zone of any state must be consistent with the state's Coastal Zone Management Plan. • Unique biological resources, including wetlands, require a level of planned management that can be addressed by an INRMP. • Installations use a watershed management approach when evaluating projects and programs to satisfy environmental regulations, facility projects, and master planning that may impact the quality of water resources. Using a watershed approach means that installations should develop a framework or plan for coordinating, integrating and managing their mission activities that impact the quality of water resources located

Excerpts from AR 200-1
Sections Applicable to Water Resources

on (and those that migrate off) their installation. This approach also requires a strong commitment to involving stakeholders, both internal and external, in the management of water resources.

- Comply with facilities policy concerning use of wastewater collection/treatment systems that are owned and operated by public or private entities when economically feasible and when security is not compromised.
- Comply with all requirements, substantive and procedural, for control and abatement of water pollution, as outlined in the CWA that require Army Compliance.
- Control or eliminate sources of pollutants and contaminants to protect water bodies and groundwater.
- Employ abatement measurement for non-point source runoff from construction, facility operations, and land management activities.
- Encourage reuse or recycling of wastewater, sewage sludge, wash rack sediment, greases or oils, and other waste whenever economically feasible and environmentally beneficial.
- Provide drinking water to fixed facilities in accordance with the requirements of the SDWA and applicable State and local regulations.
- Conduct Planning Level Surveys (PLSs) of surface waters that describe and map the distribution and extent of surface waters, and is consistent with USGS standards.
- Ensure that turbidity and sediment levels do not irreparably degrade aquatic biota and habitat from an ecosystem perspective, or significantly impact shallow ground water aquifers.
- Keep soil sediment, as a pollutant, in wetlands and waterways within compliance limits.
- Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with the mission and INRMP objectives.
- Manage species at risk and habitats [in aquatic resources] to prevent listing that could affect military readiness.

5.1.5 Fort Belvoir Water Resources Policy

Fort Belvoir has no overarching water resources policy, other than the policy addressed in this INRMP. The installation does, however, have three garrison policy memorandums: *Environmental Policy, Stormwater Pollution Prevention,* and *Stormwater Pollution Plan Requirements* – that address environmental and stormwater issues. Fort Belvoir also has four technical bulletins for erosion and sediment control, providing requirements for construction projects of various types and disturbance areas. The wetlands program has an informal guidance document for activities that impact WOUS, providing step-by-step direction on how to evaluate and proceed with projects impacting WOUS.

- ***Fort Belvoir's Environmental Policy***
  This policy promulgates the installation's commitment to environmental management. It promotes integrating sound pollution prevention practices, waste minimization, and sustainable practices into daily decisions, activities, and planning. This policy also affirms that Fort Belvoir will proactively manage environmental issues and will conserve and protect its natural resources, special natural areas, and wetlands through efficient use, reuse and sustainable management.

- ***Fort Belvoir's Stormwater Pollution Prevention Policy***
  This policy acknowledges the direct connection between stormwater pollution and impacts to the water quality of the post's waterways, the associated ecosystems, and to human health and recreational opportunities. This policy is in place to prevent illicit discharges and illegal dumping into the storm sewer systems on post in order to ensure protection of the water quality of Fort Belvoir's waterways and compliance with the Fort Belvoir VPDES MS4 and ISW permits. This policy has several provisions addressing such activities as materials storage; spill response; waste material disposal; vehicle cleaning, maintenance, and disposal; and use of de-icing materials.

- ***Fort Belvoir's Stormwater Pollution Prevention Plan (SWPPP) Requirements Policy***
  This policy provides specific requirements for commanders, supervisors, facility operators, and construction contractors regarding implementing and maintaining operational compliance with facility-specific SWPPPs. SWPPPs are required as part of the post's MS4 and ISW permits.

5.2 BASELINE WATER RESOURCES CONDITIONS

Fort Belvoir completed three separate baseline inventories for water resources on Main Post and on FBNA. The purpose of these inventories and surveys was to identify and map the boundaries and composition of watersheds and WOUS on post and to identify the existing aquatic resources present on Fort Belvoir. The baseline inventories do not provide the resolution to make pin point management decisions on water resources features or systems such as streams, wetlands or ecosystems. Field surveys and analysis (i.e. wetland delineations, benthic investigations, submerged aquatic vegetation investigations, physical constituents sampling, stream assessments) are performed to provide the needed resolution that is unavailable from the baseline inventories. Field surveys and analysis will be integrated to further refine and increase the quality of the baseline resources data.

5.2.1 Watersheds

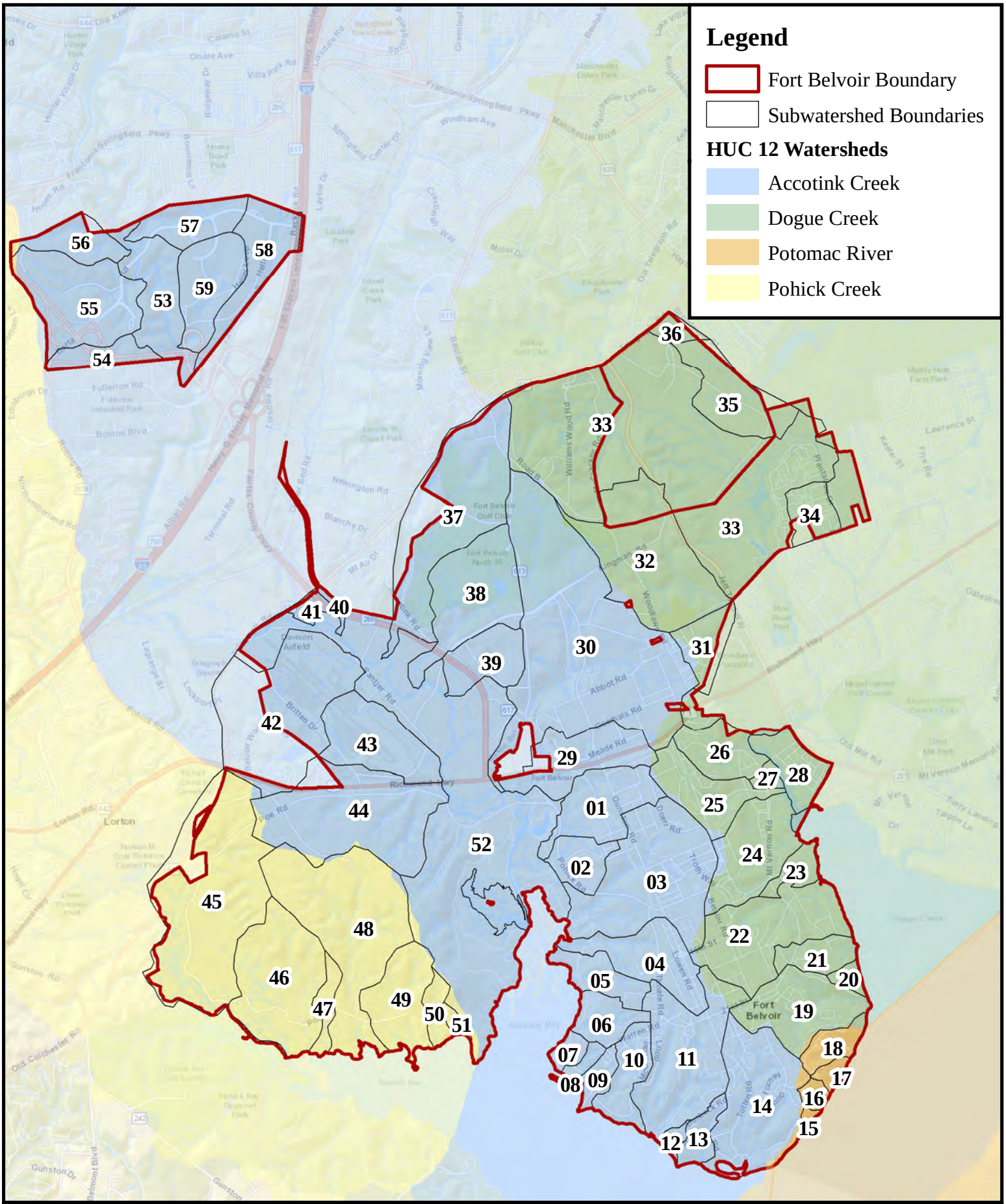
5.2.1.1 Watershed Studies

Information on watershed conditions at Fort Belvoir has been obtained through the following efforts:

A comprehensive baseline watershed survey was undertaken to characterize installation waterways and their associated watersheds, identify existing problems within installation waterways, and recommend concepts to correct problems. The findings of this watershed survey are reported in *Watershed Delineation Project and Problem Site Descriptions, Including Maps and Photographs* (Landgraf, 1999). The data from this survey have been incorporated into the Fort Belvoir GIS (Figure 5.2).

A stream corridor assessment was undertaken to further address the problem conditions identified in the 1999 watershed survey, and to develop management recommendations to correct existing problems and prevent future problems. The results of the stream corridor assessment, including management recommendations, are reported in *Watershed-based Stream Corridor Management and Protection, Fort Belvoir, Virginia*, which was prepared by the U.S. Army Corps of Engineers Waterways Experiment Station (Allen et al., 1999). This report presents a planned approach to stormwater management; erosion control; water quality management; riparian buffer restoration, maintenance and protection; and fish and wildlife habitat protection and restoration. The report addresses specific types of stream corridor problems, describes solutions, and provides overall recommendations and action items to conserve, enhance, and restore ecological conditions within stream corridors, and prevent future problems.

Finally, numerous stream assessments have been carried out yearly as a monitoring tool in order to track any changes reported in the above baseline surveys. This information is used to update the RPA information for on post streams (Figure 5.3) as well as other natural resource areas. Results from the yearly assessments are used to update information incorporated into the Fort Belvoir GIS as well as a means to provide a more thorough baseline of individual streams and waterways. This information is retained on file and utilized when appropriate for stream restoration or enhancement.



WATERSHEDS AND SUBWATERSHEDS ON FORT BELVOIR

Unclassified // FOUO

Figure 5.2

Source: HUC12 USGS Watersheds, Fort Belvoir GIS

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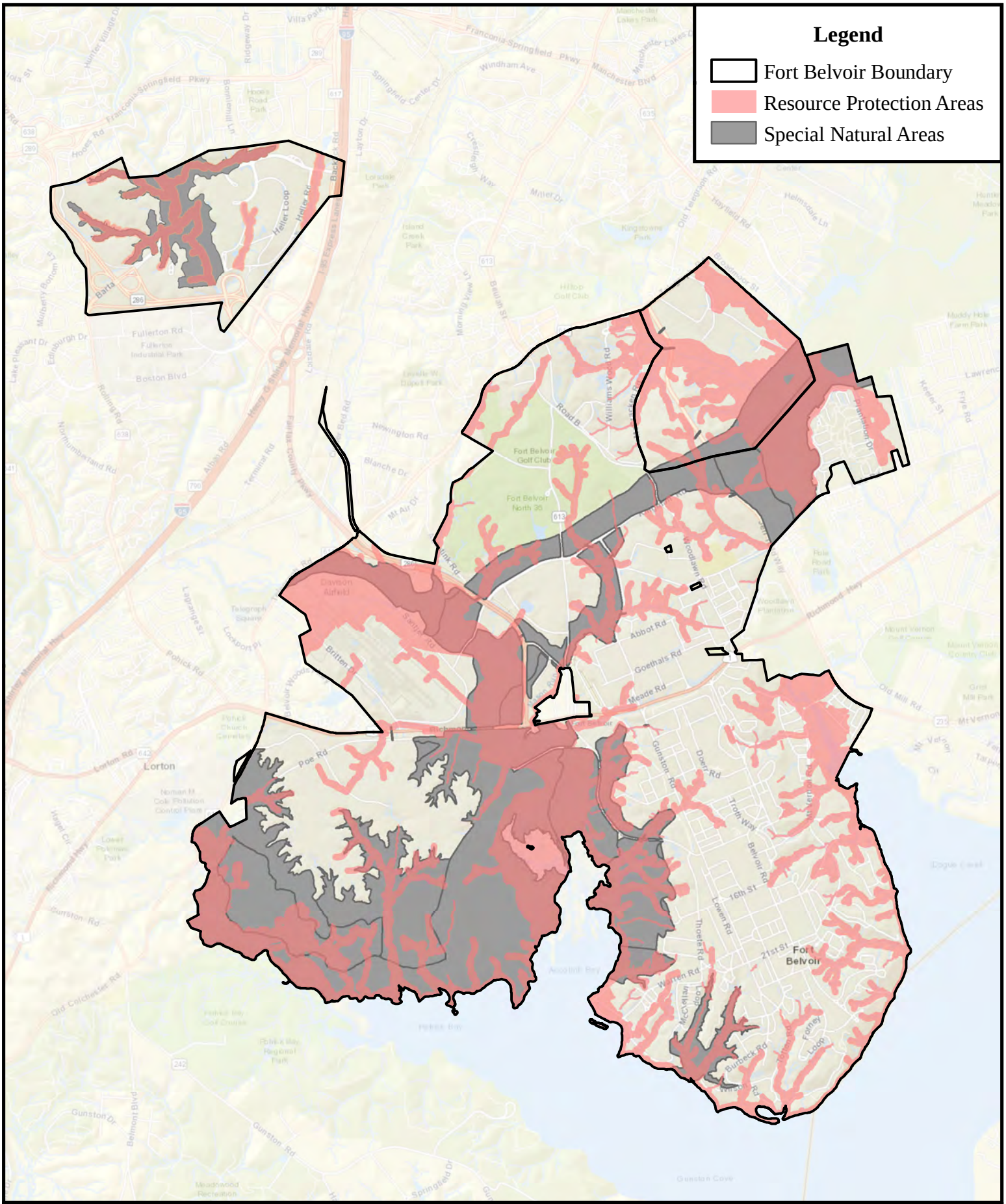

RESOURCE PROTECTION AREAS ON FORT BELVOIR

Unclassified // FOUO

Figure 5.3

Source: Fort Belvoir GIS, Google road maps,

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Table 5-1: Fort Belvoir Major Watershed Survey Summary					
Watershed	***Size (acres)***	***Impervious Surface (%)***	***Forest (%)***	***Open Area (%)***	***Wetland (%)***
Accotink Creek	4,514.66	10.11	63.06	28.06	13.49
Dogue Creek	2,334.83	11.40	65.99	22.65	17.78
Pohick Creek	698.91	0.50	94.96	4.24	19.97
Gunston Cove	680.57	16.49	51.85	31.66	2.98
Accotink Bay	603.91	18.58	45.35	42.13	4.42
Pohick Bay	565.68	0.01	93.46	6.54	5.50
Potomac River	236.61	14.24	59.62	26.15	4.34

Source: Landgraf, 1999 updated with information from the 2000 Watershed Update.

5.2.1.2 Watershed Conditions

The baseline watershed survey (Landgraf, 1999) identified seven main watersheds on Fort Belvoir (Figure 5.2, 5.4 and Table 5.1). Fort Belvoir's three largest watersheds originate off-post: the Accotink Creek, Pohick Creek, and Dogue Creek watersheds. The majority of water from within installation boundaries flows into these three watersheds. The remaining installation areas that do not drain to the three major creeks belong to four smaller on-post watersheds: the Accotink Bay, Pohick Bay, Gunston Cove, and the Potomac River watersheds. The baseline watershed survey further delineated Fort Belvoir's seven main watersheds into 53 sub-watersheds (Figure 5.2). Please note that most information below from Landgraf, 1999 has not been updated since 2000 (Landgraf, 2000) and as such does not reflect the most up to date information. An updated assessment is needed.

Accotink Creek

The Accotink Creek watershed is the largest watershed on the installation. Its total acreage on Fort Belvoir, including the FBNA, is 4,515 acres. The area is comprised of 14 sub-watersheds (Figure 5.2, 5.4, Table 5.2), 13 of which lie within the Main Post and on FBNA. Accotink Creek and its tributaries flow through the central portion of the installation, draining 3,707 acres, or 44%, of the Main Post. Forests cover 63.06% of Accotink Creek watershed on Fort Belvoir. This watershed is tidally influenced to U.S. Route 1 and is relatively undeveloped, containing only 10.11% impervious surface. The headwaters of Accotink Creek originate east of the City of Fairfax and just south of the City of Vienna. The Accotink Creek watershed contains the third highest percentage of wetlands (13.49%) on the installation (Landgraf, 1999).

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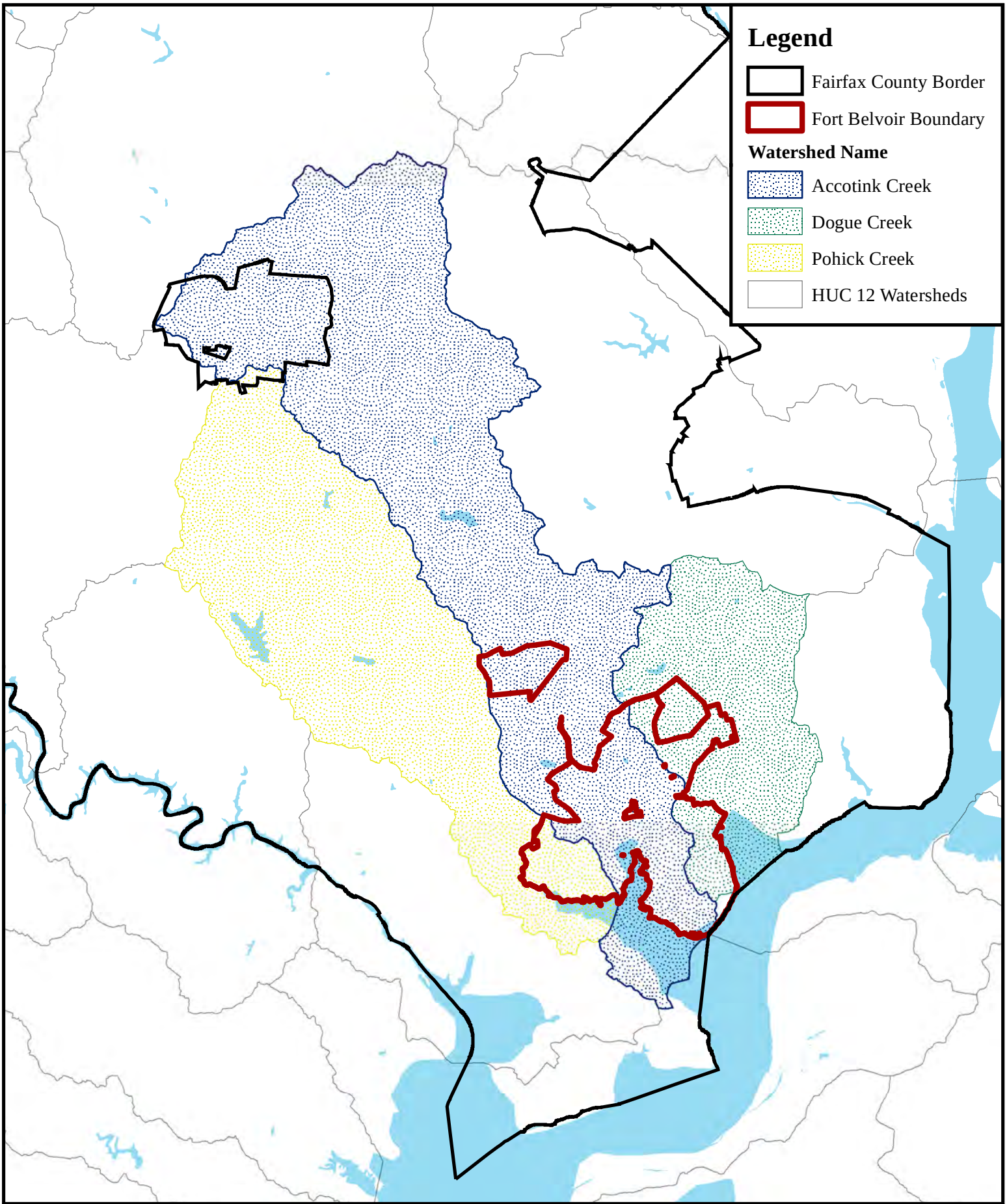

MAJOR WATERSHEDS ORIGINATING OUTSIDE of FORT BELVOIR

Figure 5.4

Unclassified // FOUO

Source: Fairfax County Government, USGS HUC 12 Watersheds, Fort Belvoir GIS

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Table 5-2: Fort Belvoir Watershed Survey Accotink Creek									
Sub-watershed	***Size (acres)***	***Impervious Surface Acres (%)***		***Forest Acres (%)***		***Open Area Acres (%)***		***Wetland Acres (%)***	
1	133.22	19.82	(14.9)	71.37	(53.57)	42.03	(31.55)	8.81	(6.61)
2	62.43	12.63	(20.2)	38.43	(61.56)	11.37	(18.21)	11.54	(18.48)
29	147.83	37.91	(25.6)	53.47	(36.17)	56.44	(38.18)	8.87	(6.01)
30	699.63	121.15	(17.3)	296.81	(42.42)	281.67	(40.26)	23.02	(3.29)
37	344.14	20.97	(6.1)	255.66	(74.29)	65.51	(19.04)	9.73	(2.83)
38	205.97	9.77	(4.8)	85.16	(41.35)	111.04	(53.91)	15.93	(7.73)
39	97.97	45.28	(46.2)	11.02	(11.25)	41.67	(42.53)	1.43	(1.46)
40	7.68	0.83	(10.8)	1.87	(24.35)	4.98	(64.84)	1.13	(14.71)
41	21.20	5.59	(26.4)	7.87	(37.14)	7.73	(36.48)	5.86	(27.65)
42	352.08	55.10	(15.6)	171.33	(48.66)	113.65	(32.28)	33.58	(9.54)
43	154.93	35.63	(23.0)	44.89	(28.97)	92.41	(48.03)	1.77	(1.14)
44	329.93	7.91	(2.4)	266.85	(80.88)	55.17	(16.72)	10.67	(3.23)
52	1,150.95	32.79	(2.9)	920.60	(79.99)	197.56	(17.16)	451.04	(39.19)
53	806.70	51.02	(6.3)	621.19	(77.00)	185.51	(23.00)	25.71	(3.19)
Total*	**4,514.66**	**456.40 (10.11)**		**2846.52 (63.06)**		**1266.74 (28.06)**		**609.09 (13.49)**	

Source: Landgraf, 1999 updated with information from the 2000 Watershed Update.
*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

Within the past 5 years, major development activity within the watershed has caused substantial changes. Most development in the watershed on post is concentrated in the area north of U.S. Route 1 and includes new/expanded facilities for the Post Exchange, new National Museum of the U.S. Army, new administrative buildings, new roads and supporting infrastructure, updates and improvements to existing infrastructure, and new industrial facilities. Development over the last 10 years includes administrative buildings, the Fort Belvoir Community Hospital, U.S. Army Legal Services Agency (USALSA), United Service Organizations (USO) Warrior and Family Center, and other support infrastructure. The impacts to this watershed will increase runoff and subsequently increase stream flow volume, both of which contribute to the instability of stream channels, and degradation of water quality and riparian lands (Landgraf, 1999). Several areas within the Accotink Creek watershed are under consideration for future facilities construction according to the RPMP.

Dogue Creek

The northeast portion of Fort Belvoir is in the Dogue Creek watershed, the second largest watershed on the installation. The Dogue Creek watershed has 15 sub-watersheds, all of which are on the Main Post (Figure 5.2, 5.4, Table 5.3). Fort Belvoir covers slightly more than one-fifth (2,335 acres) of the Dogue Creek watershed in Fairfax County (10,883 acres). The Dogue Creek watershed has the

second highest percentage of wetlands (17.78%) on the installation, including large wetland areas in the Jackson Miles Abbott Wetland Refuge (JMAWR), to help reduce storm flow velocities. Impervious surfaces cover 11.40% of the Dogue Creek watershed on Fort Belvoir, and forests cover 65.99% (Landgraf, 1999).

Table 5-3: Fort Belvoir Watershed Survey Dogue Creek

Subwatershed	*Size (acres)*	*Impervious Surface Acres (%)*		*Forest Acres (%)*		*Open Area Acres (%)*		*Wetland Acres (%)*	
20	16.82	0.46	(2.7)	12.39	(73.66)	3.97	(23.61)	0.76	(4.52)
21	54.22	8.61	(15.9)	27.74	(51.16)	17.87	(32.96)	2.22	(4.09)
22	217.74	45.99	(21.1)	84.51	(38.81)	87.25	(40.07)	12.17	(5.59)
23	40.72	3.94	(9.7)	30.87	(75.81)	5.91	(14.51)	6.22	(15.28)
24	161.99	29.72	(18.3)	89.98	(55.55)	42.29	(26.11)	11.74	(7.25)
25	113.35	15.61	(13.8)	39.79	(35.11)	57.95	(51.12)	3.93	(3.47)
26	72.61	6.40	(8.8)	35.02	(48.23)	31.19	(42.96)	7.72	(10.63)
27	26.89	4.90	(18.2)	9.76	(36.31)	12.23	(45.48)	7.08	(26.33)
28	72.47	14.96	(20.6)	16.57	(22.86)	40.94	(56.49)	19.38	(26.74)
31	68.95	14.10	(20.4)	39.65	(57.51)	15.21	(22.04)	0.37	(0.54)
32	302.28	16.12	(5.3)	258.71	(85.58)	27.46	(9.08)	18.35	(6.07)
33	830.69	58.91	(7.1)	704.77	(84.84)	67.02	(8.07)	223.75	(26.94)
34	202.62	33.40	(16.5)	76.36	(37.69)	92.86	(45.83)	46.71	(23.05)
35	130.29	11.53	(8.8)	97.03	(74.47)	21.73	(16.68)	47.31	(36.31)
36	23.19	0.77	(3.3)	17.56	(75.72)	4.86	(20.96)	7.41	(31.91)
Total*	**2334.83**	**265.42 (11.40)**		**1540.71 (65.99)**		**528.74 (22.65)**		**415.12 (17.78)**	

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

The Dogue Creek watershed has the most intense off-post development of the three main watersheds on Fort Belvoir over the last 15 years. Much of Base Realignment and Closure (BRAC) development (i.e., Fort Belvoir Community Hospital, MDA, and supporting infrastructure) occurred in this watershed. Development only recently has slowed. Portions of the watershed within the limits of Fort Belvoir remain relatively undeveloped due to the presence of JMAWR.

Within the installation, the Dogue Creek watershed contains nine of the fourteen housing areas, a school, day care, administrative offices, two hotels, a marina, and supporting infrastructure. All of these developed areas contribute a considerable amount of impervious surface area which ultimately drain to Dogue Creek. The high percentage of impervious surface area leads to increases in runoff velocities, pollution, and accelerates downstream erosion. Several areas within the Dogue Creek watershed are under consideration for future facilities construction according to the RPMP.

Pohick Creek

The Pohick Creek watershed is in the southwest corner of the installation, in the undeveloped South Post training area. Fort Belvoir contains only 3% (699 acres) of the overall area (22,755 acres) of the Pohick Creek watershed as delineated by Fairfax County. Two subwatersheds of Pohick Creek are located on post (Figure 5.2, 5.4, Table 5.4). Pohick Creek is the least developed of the three main Fort Belvoir watersheds. The headwaters of Pohick Creek originate just south of the City of Fairfax (Figure 5.4) and are tidally influenced up to the Old Colchester Road crossing at Fort Belvoir's western boundary. As with the other major watersheds, the Pohick Creek watershed has been experiencing development outside of the limits of Fort Belvoir. Much of the available land just outside of the installation limits has been developed with much of the greater watershed experiencing the same type of development. Within the installation, the Pohick Creek watershed has the lowest percentage of open area (4.24%), the second lowest percentage of impervious surface (0.5%), and the highest percentage of wetlands (19.97%) and forests (94.96%) (Landgraf, 1999).

Table 5-4: Fort Belvoir Watershed Survey Pohick Creek

Sub watershed	*Size (acres)*	*Impervious Surface Acres (%)*	*Forest Acres (%)*	*Open Area Acres (%)*	*Wetland Acres (%)*
45	458.51	3.51 (0.80)	424.64 (92.61)	28.36 (6.19)	87.11 (19.00)
46	240.40	0.05 (0.02)	239.07 (99.45)	1.28 (0.53)	52.46 (21.82)
Total*	**698.91**	**3.56 (0.50)**	**663.71 (94.96)**	**29.64 (4.24)**	**139.57 (19.97)**

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

The Noman M. Cole, Jr. Pollution Control Plant, formerly known as the Lower Potomac Pollution Control Plant, is a wastewater treatment facility located immediately adjacent to Fort Belvoir on Pohick Creek between Old Colchester Road and U.S. Route 1. Discharges from the treatment plant can represent a substantial increase to the natural flow regime of Pohick Creek increasing discharge flows up to an additional 67 million gallons per day. The plant has been meeting 100% NPDES permit compliance for the last 18 years, helping to minimize impacts to water resources on Fort Belvoir. The only on-post development in this watershed are the horse stables in the south west training area.

Gunston Cove

The Gunston Cove watershed consists of areas on Fort Belvoir that drain directly from Fort Belvoir into Gunston Cove, without first entering Accotink Bay or Pohick Bay. It is one of the four watersheds that originate on post, and is

completely contained within Fort Belvoir. Gunston Cove is a tidal waterway, and its watershed is comprised of seven subwatersheds on the installation totaling 681 acres (Figure 5.2, 5.4, Table 5.5). Of the seven Fort Belvoir watersheds, the Gunston Cove watershed contains the second highest percentage of both impervious surface and open area (16.49% and 31.66% respectively). The watershed also contains the lowest percentage of wetlands (2.98%). The Gunston Cove watershed on Fort Belvoir is 51.85% forested (Landgraf, 1999).

Table 5-5: Fort Belvoir Watershed Survey Gunston Cove

Subwatershed	***Size (acres)***	***Impervious Surface Acres (%)***	***Forest Acres (%)***	***Open Area Acres (%)***	***Wetland Acres (%)***
8	14.83	2.45 (16.5)	8.26 (55.71)	4.12 (27.78)	0.31 (2.02)
9	30.56	1.51 (4.9)	23.31 (76.28)	5.75 (18.82)	1.35 (4.42)
10	78.31	5.36 (6.8)	57.29 (73.16)	15.66 (20.01)	2.47 (3.15)
11	251.62	45.51 (18.1)	125.34 (49.81)	80.77 (32.11)	8.86 (3.52)
12	12.28	2.44 (19.9)	3.79 (30.86)	6.05 (49.27)	0.59 (4.81)
13	44.59	9.37 (21.0)	16.49 (36.98)	18.73 (42.01)	1.71 (3.83)
14	248.38	45.58 (18.4)	118.41 (47.67)	84.41 (33.98)	5.02 (2.02)
Total*	**680.57**	**112.22 (16.49)**	**352.89 (51.85)**	**215.49 (31.66)**	**20.31 (2.98)**

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

Within the Gunston Cove watershed on Fort Belvoir, steeply graded tributary streams coming down from the upper plateau area are accelerating downstream gully and bank erosion. Sediment from the gully erosion is being deposited in the wetland area prior to Gunston Cove. The impacted streams in this watershed continue to have impacts on water resources.

Accotink Bay

The Accotink Bay watershed consists of areas that drain directly from Fort Belvoir into Accotink Bay without first draining into Accotink Creek. The watershed originates on, and is completely contained within, Fort Belvoir. Accotink Bay is tidal, and receives drainage from five subwatersheds with a total area of 604 acres (Figure 5.2, 5.4, Table 5.6). It has the highest overall impervious surface and open area percentages on the installation (18.58% and 42.13% respectively), making it a candidate for reforestation and reduction of impervious surface area. The watershed is 4.42% wetland, and contains the lowest percentage of forested land (45.35%) (Landgraf, 1999).

Table 5-6: Fort Belvoir Watershed Survey Accotink Bay					
Subwatershed	***Size (acres)***	***Impervious Surface Acres (%)***	***Forest Acres (%)***	***Open Area Acres (%)***	***Wetland Acres (%)***
3	330.68	54.74 (16.60)	134.99 (40.82)	140.95 (42.62)	14.94 (4.52)
4	132.38	39.54 (29.90)	38.99 (29.45)	53.85 (40.68)	7.12 (5.38)
5	58.01	10.76 (18.60)	39.68 (68.41)	44.11 (13.05)	1.82 (3.14)
6	60.87	4.01 (6.60)	54.04 (88.79)	2.82 (4.63)	2.39 (3.93)
7	21.97	3.15 (14.30)	6.15 (27.99)	12.67 (57.67)	0.41 (1.87)
Total*	**603.91**	**112.20 (18.58)**	**273.85 (45.35)**	**254.40 (42.13)**	**26.68 (4.42)**

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

Improvements in this watershed include a regional stormwater pond that is being constructed as well as several stream restorations. This will decrease impacts from impervious area; however, a high percentage of impervious area will remain due to the preexisting development in this watershed.

Pohick Bay

The Pohick Bay watershed consists of areas on Fort Belvoir that drain directly from Fort Belvoir into Pohick Bay, without first draining into Pohick Creek. The watershed originates on Fort Belvoir. Pohick Bay is tidal and receives drainage from five subwatersheds with a total area of 566 acres (Figure 5.2, 5.4, Table 5.7). The Pohick Bay watershed has the lowest percentage of impervious surface (0.01%) and the second highest percentage of forest (93.46%). The watershed on post is 5.50% wetland. Most of Pohick Bay's subwatersheds on post contain little or no impervious surface, and little or no open area (Landgraf, 1999).

Table 5-7: Fort Belvoir Watershed Survey Pohick Bay					
Subwatershed	***Size (acres)***	***Impervious Surface Acres (%)***	***Forest Acres (%)***	***Open Area Acres (%)***	***Wetland Acres (%)***
47	33.25	0.00 (0.000)	33.24 (99.97)	0.01 (0.03)	2.23 (6.71)
48	363.08	0.01 (0.003)	326.11 (89.82)	36.96 (10.18)	16.84 (4.64)
49	127.18	0.02 (0.015)	127.15 (99.97)	0.01 (0.01)	10.47 (8.23)
50	31.63	0.00 (0.000)	31.62 (99.97)	0.01 (0.03)	1.02 (3.22)
51	10.54	0.00 (0.000)	10.54 (100.00)	0.00 (0.00)	0.56 (5.31)
Total*	**565.68**	**0.03 (0.010)**	**528.66 (93.46)**	**36.99 (6.54)**	**31.12 (5.50)**

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

This watershed is in the undeveloped South Post training area, and includes part of the Accotink Bay Wildlife Refuge (ABWR). Subwatershed 48 contains the only known intact example of an upper coastal plain stream. This stream has remained minimally un-impacted and naturalized and is recommended to be used as a baseline for stream restorations on the installation. The predominant development feature in this watershed is the network of paved and unpaved training roads. Problem areas in the watershed are isolated and usually occur at culvert crossings on the training roads.

Potomac River

A small part of Fort Belvoir drains directly into the Potomac River without first entering Accotink Creek, Dogue Creek, Pohick Creek, Gunston Cove, Accotink Bay, or Pohick Bay. This watershed originates on, and is completely contained within, Fort Belvoir. The Potomac River watershed is comprised of five subwatersheds and has a total area of 237 acres, making it the smallest watershed on the installation (Figure 5.2, 5.4, Table 5.8). The watershed is 14.24% impervious, 59.62% forested, and 4.34% wetland. The Potomac River subwatershed 15 is the smallest subwatershed on post at slightly more than five acres, and is 100% forested (Landgraf, 1999).

Table 5-8: Fort Belvoir Watershed Survey Potomac River								
Subwatershed	***Size (acres)***	***Impervious Surface Acres (%)***		***Forest Acres (%)***	***Open Area Acres (%)***		***Wetland Acres (%)***	
15	5.26	0.00	(0.0)	5.26 (100.00)	0.00	(0.00)	0.35	(6.65)
16	16.61	0.02	(0.1)	16.02 (96.45)	0.59	(3.54)	1.32	(7.95)
17	15.91	1.10	(6.9)	13.07 (82.15)	1.74	(10.94)	1.08	(6.79)
18	43.97	5.27	(12.0)	27.19 (61.84)	11.51	(26.18)	0.90	(2.05)
19	154.86	27.31	(17.6)	79.52 (51.35)	48.03	(31.01)	6.62	(4.27)
Total*	**236.61**	**33.70 (14.24)**		**141.06 (59.62)**	**61.87 (26.15)**		**10.27 (4.34)**	

Source: Landgraf, 1999.

*Total acreages (and percentages) under each land use/land cover category (i.e., impervious, forest, open area, and wetland) do not combine to equal the total acreage (100%) for the watershed because some areas of overlap exist.

The Potomac River watershed also has the steepest stream gradients on the installation, with slopes as high as 60%. Three of the subwatersheds are relatively undeveloped due to the severe slopes above the Potomac River.

5.2.2 Aquatic Resources

5.2.2.1 Aquatic Studies

A baseline aquatic inventory of Main Post and FBNA (EA, 2000) was performed in 2000 in order to characterize the installation's aquatic resources and provide management recommendations. A Natural Heritage Inventory was performed on Main Post to address the biodiversity of the installation's natural resources (Hobson, 1996; 1997). The baseline inventory included the collection and analysis of basic water quality parameters, the sampling of fish (including anadromous fish) and aquatic invertebrates, and the development of habitat indices. Data from the baseline aquatic inventory and Natural Heritage Inventory have been incorporated into the installation GIS.

Aquatic studies which assess water quality, physical, and biological conditions within Fort Belvoir water resources are on Table 5.9. Most aquatic studies over the last five years have been limited to project studies and were used to establish the baseline condition of a particular water resource such as a tributary stream or shoreline or used for future restoration to meet mitigation goals.

Table 5-9: Fort Belvoir Area Aquatic Resources Studies				
Agency	***Author***	***Survey Area***	***Information***	***Years***
Fairfax County	Jones and Kelso (George Mason University)	Accotink Creek, Pohick Creek, Gunston Cove, Dogue Creek	Climate, water quality, plankton, fish (including anadromous fish), benthic organisms	1984
U.S. Geological Survey (USGS)	Ator et al.	5 miles upstream of EPG (now known as FBNA) and 8 miles upstream of Fort Belvoir Main Post on Accotink Creek in Potomac River basin	Hydrology, environmental setting, water quality parameters (nutrients, pesticides, organics, metals, sediment), water quality ranking in a national context	1992, 1996
Fort Belvoir	Dames and Moore, Inc., 1997	North Post Golf Course drainages	Water quality (nutrient and pesticide runoff)	1996, 1997
Fort Belvoir	Jones and Kelso (George Mason University)	Accotink Creek, Pohick Creek, Dogue Creek	Benthic macroinvertebrates, plankton, fish, habitat, water quality	1999
Fort Belvoir	EA	Accotink Creek, Dogue Creek, Mason Run, UN-1, UN-2	Benthic macroinvertebrates, fish (including anadromous fish), habitat, water quality	1999
Fort Belvoir	EA	Accotink Creek, Dogue Creek, Mason Run, UN-1, UN-2	Benthic macroinvertebrates, fish (including anadromous fish), habitat, water quality	2001
Fort Belvoir	SES	Stream 7, Marrow Road	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2011
Fort Belvoir	U.S. Army Corps of Engineers, Baltimore District	Sharon Lane Stream, Child Development Center Stream, Golf Course Stream	Geomorphic Analysis	2012

Table 5-9: Fort Belvoir Area Aquatic Resources Studies				
Agency	***Author***	***Survey Area***	***Information***	***Years***
Fort Belvoir	Williamsburg Environmental Group, Inc.	Timber Pedestrian Bridge Accotink Creek	Threatened and Endangered Species	2013
Fort Belvoir	EA	7 Streams on Main Post	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2014
Fort Belvoir	Department of Public Works	Rep 002 Stream at DAAF	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2015
Fort Belvoir	Department of Public Works	Hunting Area W-2	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2015
Fort Belvoir	Department of Public Works	Pohick Road Stream	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2015
Fort Belvoir	Department of Public Works	Rep 003 Stream and Tributary at DAAF	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2015
Fort Belvoir	Department of Public Works	Road Millings Area and Tributary to Road Millings Storage	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2015
Fort Belvoir	Department of Public Works	Accotink and Dogue Creek	Native Freshwater Mussel Study	2015
Fort Belvoir	Aerostar SES LLC	Main Post	Benthic Macroinvertebrate, Periphyton, Habitat Assessment, Physical Characterization, Riparian Vegetation	2015
Fort Belvoir	Department of Public Works	Staybridge Suites Stream	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2015, 2016

Table 5-9: Fort Belvoir Area Aquatic Resources Studies				
Agency	***Author***	***Survey Area***	***Information***	***Years***
Fort Belvoir	Aerostar SES LLC	South post streams	Benthic Macroinvertebrate, Periphyton, Habitat Assessment, Physical Characterization, Riparian Vegetation	2016
Fort Belvoir	Department of Public Works	Stuart Road Stream	Geomorphology, Hydrology, Biology	2016
Fort Belvoir	Department of Public Works	Tompkins Basin Stream	Geomorphology, Hydrology, Biology	2016
Fort Belvoir	Department of Public Works	Golf Course Streams	Stream Assessment (Physical Characterization/Water Quality and Habitat Assessment)	2016
Fort Belvoir	SES Construction & Fuel Services LLC	Gunston Cove and Accotink Bay	Freshwater Bivalve and Submerged Vegetation Sampling	2016

5.2.2.2 Aquatic Conditions

Water Quality

Fort Belvoir regularly collects water quality samples in the Accotink Creek and Dogue Creek Watersheds and tests for regulated constituents, including, but not limited to, total suspended solids (TSS), pH, total petroleum hydrocarbons (TPH), Nitrogen, Phosphorous, and metals. This sampling is performed in order to comply with the Virginia Pollutant Discharge Elimination System permit requirements, which establishes benchmarks for maximum allowable discharges. If any benchmark exceedances occur, corrective actions are taken. Because the Pohick Creek Watershed remains undeveloped, no monitoring is performed there.

The water quality sampling results provide a means to assess the chemicals which impact water resources strictly on post, minimizing influences from Fairfax County. Regardless of existing water quality conditions, the Accotink, Pohick, and Dogue Creeks are all recognized by the State of Virginia as impaired waterways due to high levels of regulated constituents and other substances, such as sediment and E. coli, which have been historically proven to degrade water.

Water quality assessments have limitations due to inconsistencies in sampling techniques. In addition, development occurring outside of Fort Belvoir impacts water quality assessments on post. However, this data can be evaluated along with regulatory monitoring data and additional studies to find trends and hypothesize future water resource impacts. While the Dogue Creek and Pohick Creek watersheds will most likely not reach the same level of degradation as Accotink Creek, further impacts to water quality for all watersheds can be expected.

Physical Conditions

Physical conditions of water resources found at Fort Belvoir include a mix of Riverine and Palustrine ecosystems. The Riverine systems include the Accotink, Dogue and Pohick Creeks as well as various tributaries and streams feeding these creeks. The three creeks are considered lower perennial streams with unconsolidated bottoms consisting of a mixture of cobble-gravel, sand, muds, and organics. The mouths of the three creeks have conditions consistent with emergent, unconsolidated, and rocky shores.

The various tributaries and streams that feed into these three creeks were observed to be perennial, intermittent, and ephemeral tributary streams that can be composed of rubble, cobble-gravel, sand, muds, and organics. They originate from a mixture of groundwater, stormwater, wetlands, rain, and seeps. All are considered to be warm water systems due to the regional location and general shallow flows in relation to ambient temperature typical of Northern Virginia.

Most of the riverine systems are found to have riparian habitat that includes trees, shrubs, and an herbaceous layer. In-stream features typically observed range from partly open to shade with a combination of riffles, runs, and pools. Channelization is common within tributaries of these watersheds due to concentrated flows over the last 70 years but the Accotink, Dogue and Pohick Creeks remain un-channelized. There is one known physical barrier located just outside of Fort Belvoir on Dogue Creek that acts as an impediment to fish and other aquatic organisms.

Physical habitat degradation (e.g., lower bank stability, bank erosion) is prevalent within virtually all of the installation's waterways surveyed. Aquatic vegetation can be found on a case by case basis and can typically include submerged and attached algae as well as various types of aquatic vegetation. Aquatic beds can be found in the channels and along the shores of Accotink, Dogue, and Pohick Creeks as well.

The second type of ecosystem and the most predominant on Fort Belvoir is Palustrine. Palustrine systems can include forested, scrub-shrub, emergent, seep, and open wetlands. There is great variability to these habitats, including groundwater recharge/discharge rates, flood flow alterations, habitat conditions, vegetation, and hydrology. These types of physical conditions most often are found to have some nexus with Riverine systems. Most systems present at Fort Belvoir are Palustrine forested or Palustrine emergent.

Benthic Community

Studies of macrobenthic organisms on unrestored streams within Fort Belvoir (Table 5-9) continually indicate a macroinvertebrate community fairly typical of upper Coastal Plain streams. These studies show a predominance of pollution tolerant species such as Chironomidae, Naidinae, Cyclopoidea, Amphipod, and Isopods. Studies performed on Fort Belvoir suggest decreased occurrence of the traditional non-pollution tolerant species of EPT (i.e., Ephemeroptera, Plecoptera, Trichoptera) typically associated with optimal streams. The species composition found in tributary streams indicates a benthic community tolerant of impaired physical habitats, as well as poor to fair water quality. Some streams contain benthic communities that have a greater dominance of non-pollution tolerant species of EPT; however, most benthic communities resemble a composition of pollution tolerant communities due to the past 70 years of development.

Habitat Assessments

Habitat assessment of riverine communities is performed by assessing ten habitat parameters to make a determination on conditions of aquatic resources. The parameters are epifanual substrate/available cover, pool substrate characterization, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuosity, bank stability, vegetative protection, and

riparian vegetative zone width. These parameters are used to rank the habitat condition as either optimal, suboptimal, marginal, or poor. Many of the tributary streams are found to be suboptimal to marginal due to development and concentrated stormwater flows into streams. Additionally, the Accotink Creek, Dogue Creek, Pohick Creek, Pohick Bay, Accotink Bay, and Gunston Cove are known to contain submerged aquatic vegetation (SAV). Finally, habitat assessments of the Accotink, Dogue, and Pohick Creeks are typically done for species management actions and information on this can be found in the wildlife section.

5.2.3 Wetland Resources

5.2.3.1 Wetland Studies

Information on wetlands at Fort Belvoir has been and continues to be obtained through the following efforts:

First, a comprehensive baseline wetland survey was undertaken to characterize installation wetlands, and their corresponding location association with identified water ways. The findings of this wetlands survey are reported in Paciulli, Simmons and Associates, 1997a and Paciulli, Simmons and Associates, 1999b. The purpose of these baseline surveys, also referred to as planning level surveys (PLS), was to identify and map the general locations and types of wetlands on post. The surveys were not intended to serve as jurisdictional determinations.

The baseline wetland inventories were done using photointerpretation of installation aerial photography with limited field surveys to ground truth. Numerous wetland delineations were then performed following the U.S. Army Corps of Engineers wetland delineation manual (Environmental Laboratory, 1987), and the wetland types were classified according to the U.S. Fish and Wildlife Service classification system (Cowardin et al., 1979) to verify the accuracy of the photointerpretation. This was the foundation of the baseline wetlands inventory.

Second, numerous wetland delineations are performed as the primary in-field mechanism in order to confirm wetland locations and jurisdiction. The results of the wetland delineations become incorporated into the comprehensive baseline wetland survey in order to improve the accuracy of the resource.

Third, a wetland functions and values assessment can be performed as a tool to rapidly characterize the functions and values of wetland ecosystems. This tool is traditionally only required under circumstances that will involve the impact of greater than one acre of wetlands. This assessment is limited in use due to the above threshold value but it does provide valuable information on the processes or series of processes that typically take place in these specific areas. This

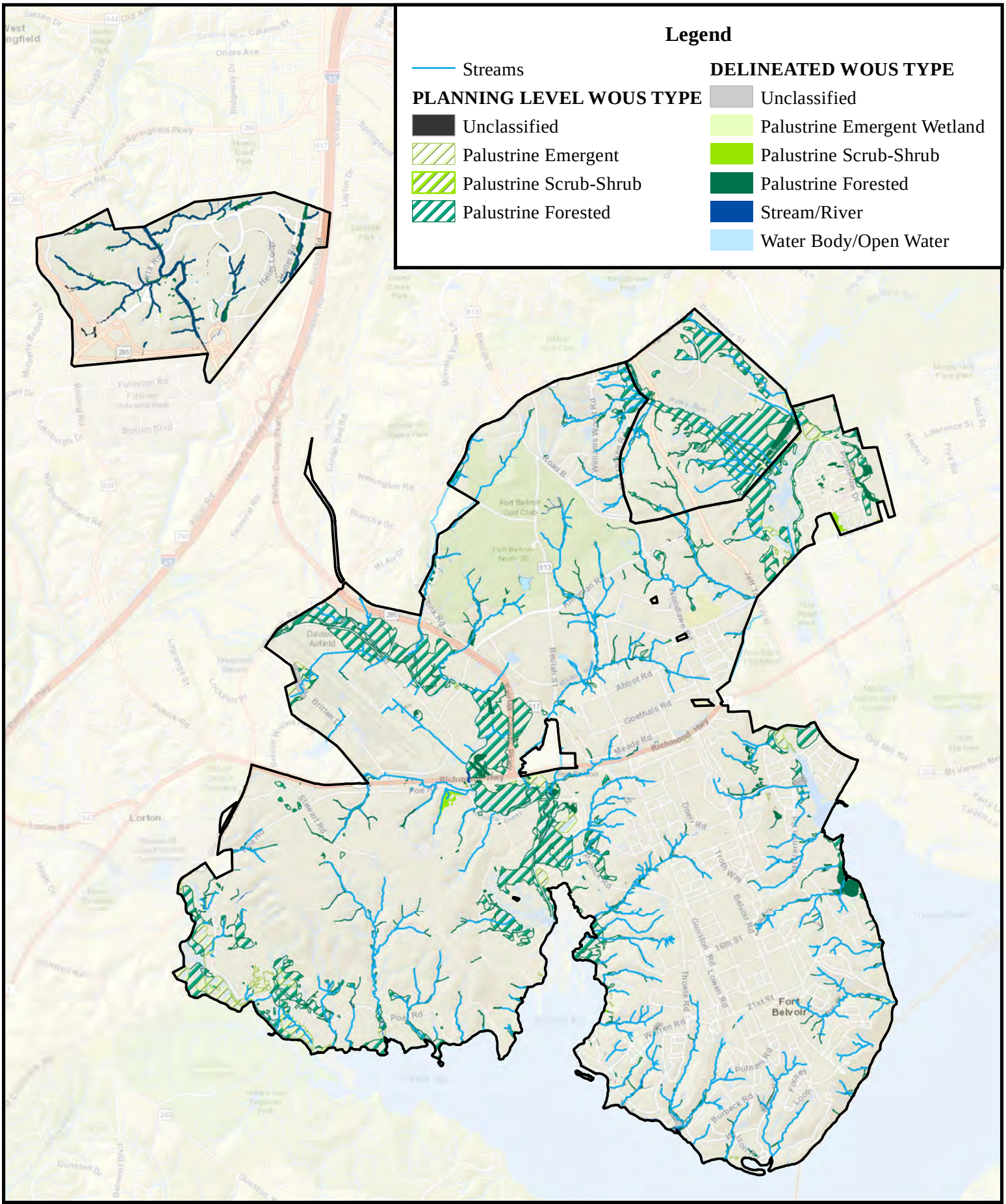
information becomes catalogued and can be referenced for management actions or future work at Fort Belvoir.

Finally, Resource Protection Area (RPA) assessments are carried out during wetland delineation by a project proponent when the appropriate water resources are present. This information is used in conjunction with wetland delineations in order to highlight what the State of Virginia views as sensitive natural resources as well as to designate the perenniality of a stream system for use in federally required mitigation when appropriate. This can impact the mitigation requirements by the USACE for WOUS impacts. Results from RPA assessments are used to update information in the Fort Belvoir GIS as well as a means to provide more thorough baseline information for wetland resources and waterways. This information is retained on file and utilized when appropriate to provide exclusion limits for projects or to identify areas that would be ideal for enhancement.

5.2.3.2 Wetland Conditions

As of the 1997 baseline inventory, approximately 1,250 acres of wetlands were identified on Fort Belvoir's Main Post and approximately 26 acres on Fort Belvoir North Area using the baseline wetland surveys (Paciulli, Simmons and Associates, Ltd., 1997a; 1999b). These figures remain relatively unchanged at this time. In total, this represents approximately 11% and 3% of the two installation areas, respectively. As shown in Figures 5.5-5.9, the predominant wetland type on Fort Belvoir is Palustrine Forested, which tends to occur in association with the riparian areas of Accotink, Dogue, and Pohick Creeks. Other wetlands typically found within the limits of Fort Belvoir include Palustrine Emergent and Palustrine Scrub-Shrub.

In 2007, Fort Belvoir performed a wetland delineation and obtained a jurisdictional determination for all of FBNA as well as a large portion of main post under BRAC 2005. A final wetland delineation and jurisdictional determination was also obtained in 2009 for numerous American Water infrastructure upgrade projects. These were the last large updates to baseline wetland inventories.



WATERS OF THE US ON FORT BELVOIR

Unclassified // FOUO

Figure 5.5

Source: Fort Belvoir 1997 wetland surveys, additional jurisidictional determinations from 1997-2017, Google road maps,

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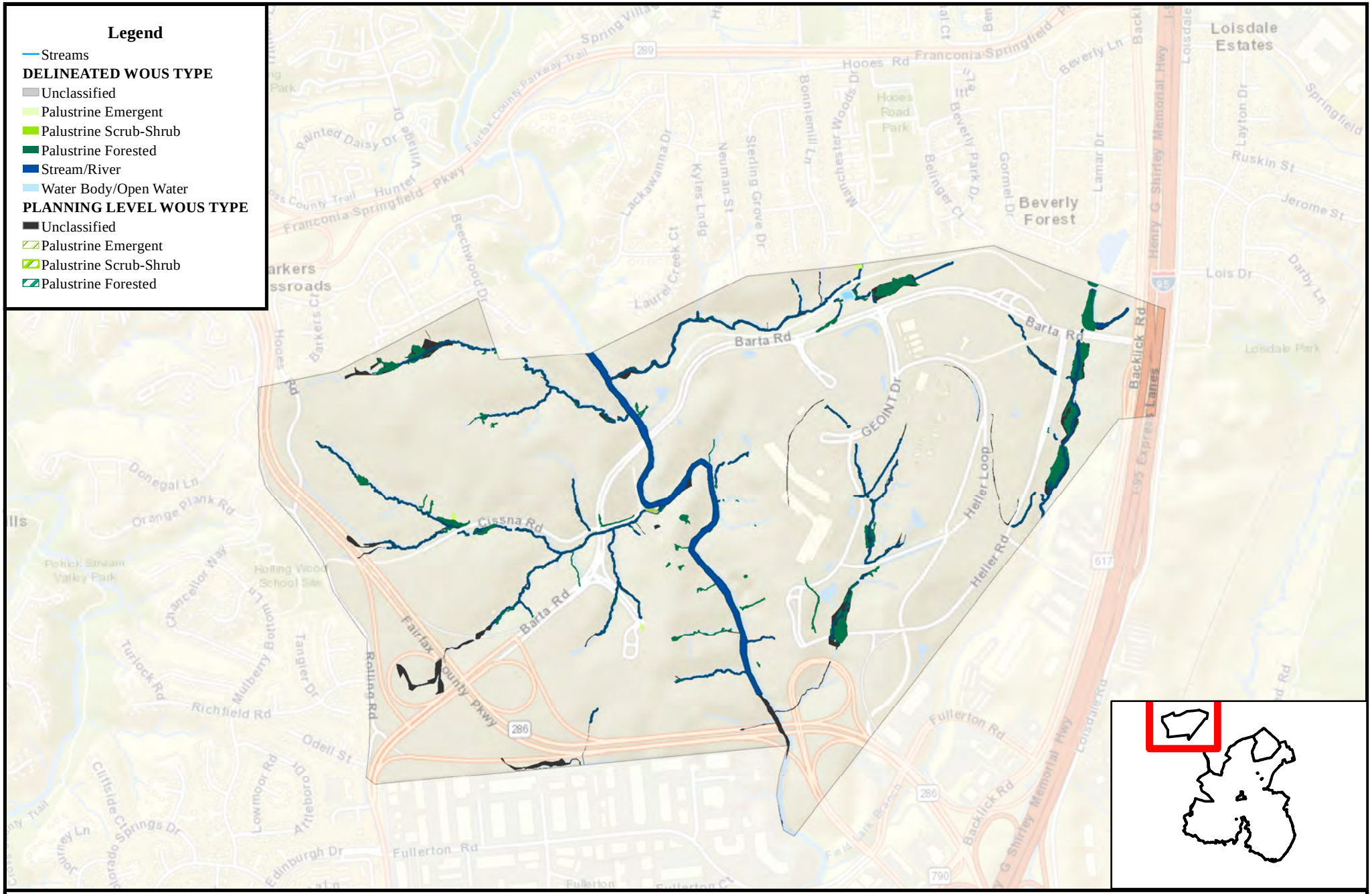

FORT BELVOIR WATERS OF THE US, NORTH AREA

Unclassified // FOUO

Figure 5.6

Source: Fort Belvoir 1997 wetland surveys, additional jurisidictional determinations from 1997-2017, Google road maps

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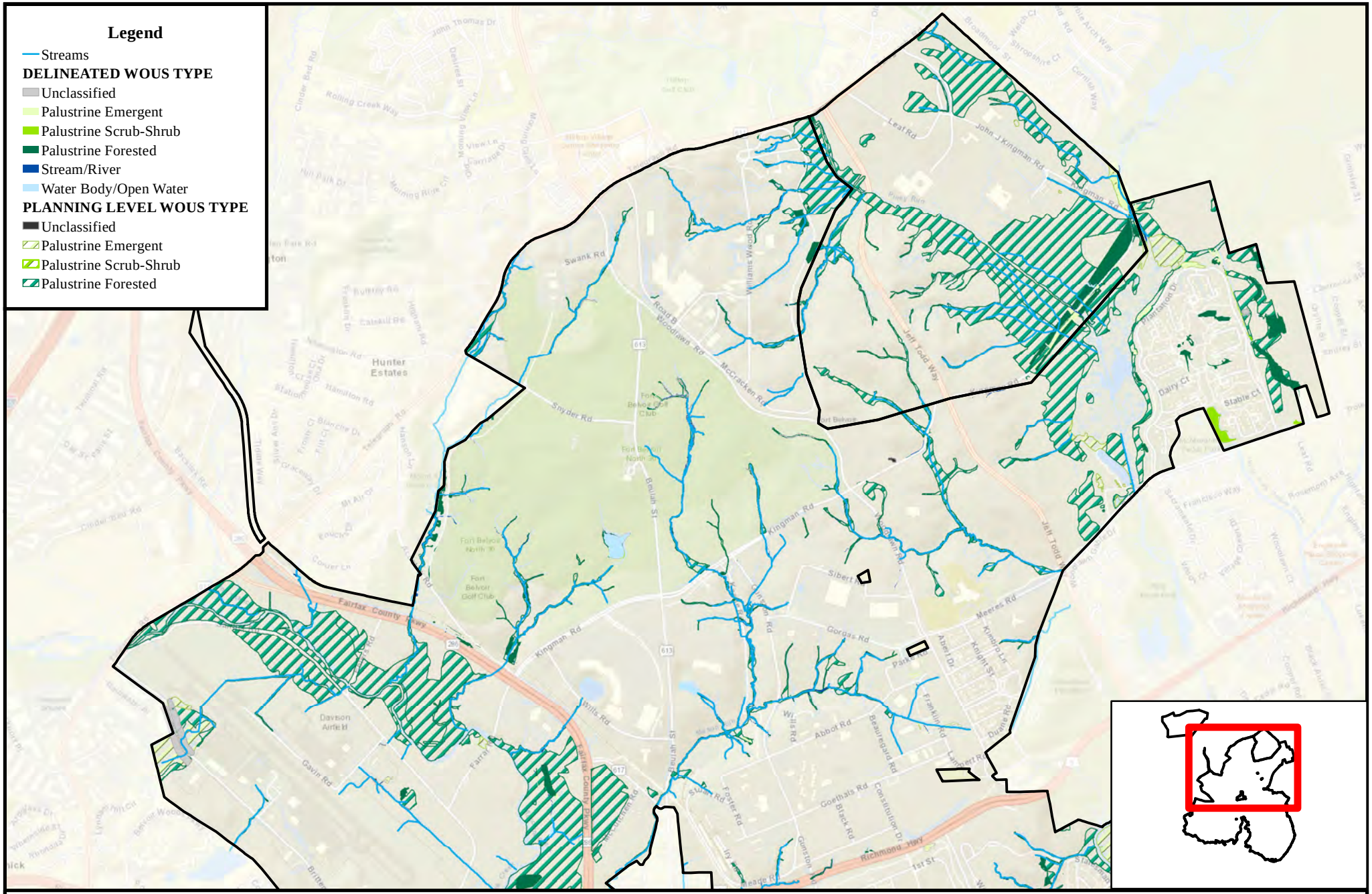

FORT BELVOIR WATERS OF THE US, NORTH

Unclassified // FOUO

Figure 5.7

Source: Fort Belvoir 1997 wetland surveys, additional jurisidictional determinations from 1997-2017, Google road maps

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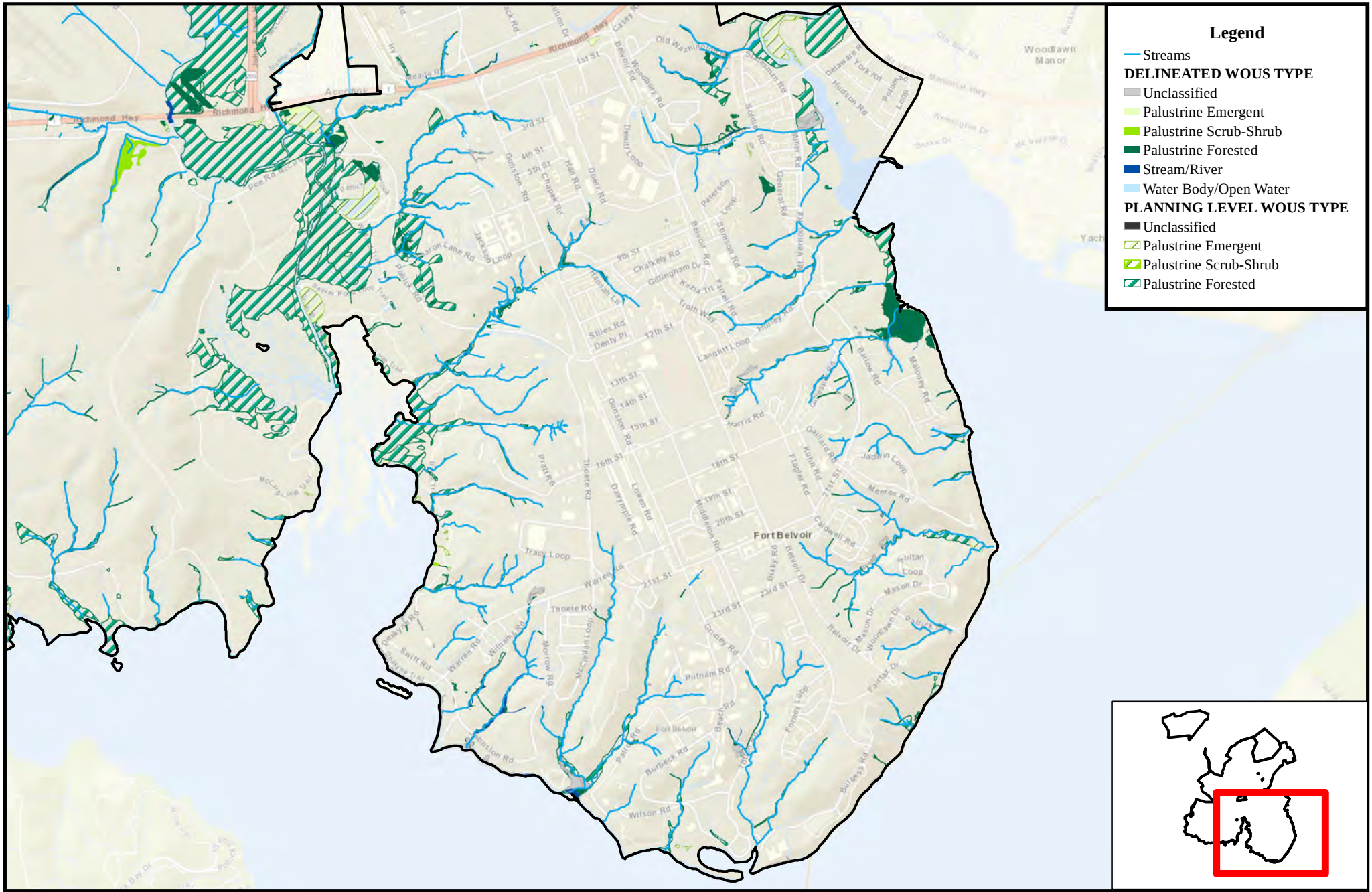

WATERS OF THE US ON FORT BELVOIR, SOUTH EAST

Unclassified // FOUO

Figure 5.8

Source: Fort Belvoir 1997 wetland surveys, additional jurisidictional determinations from 1997-2017, Google road maps

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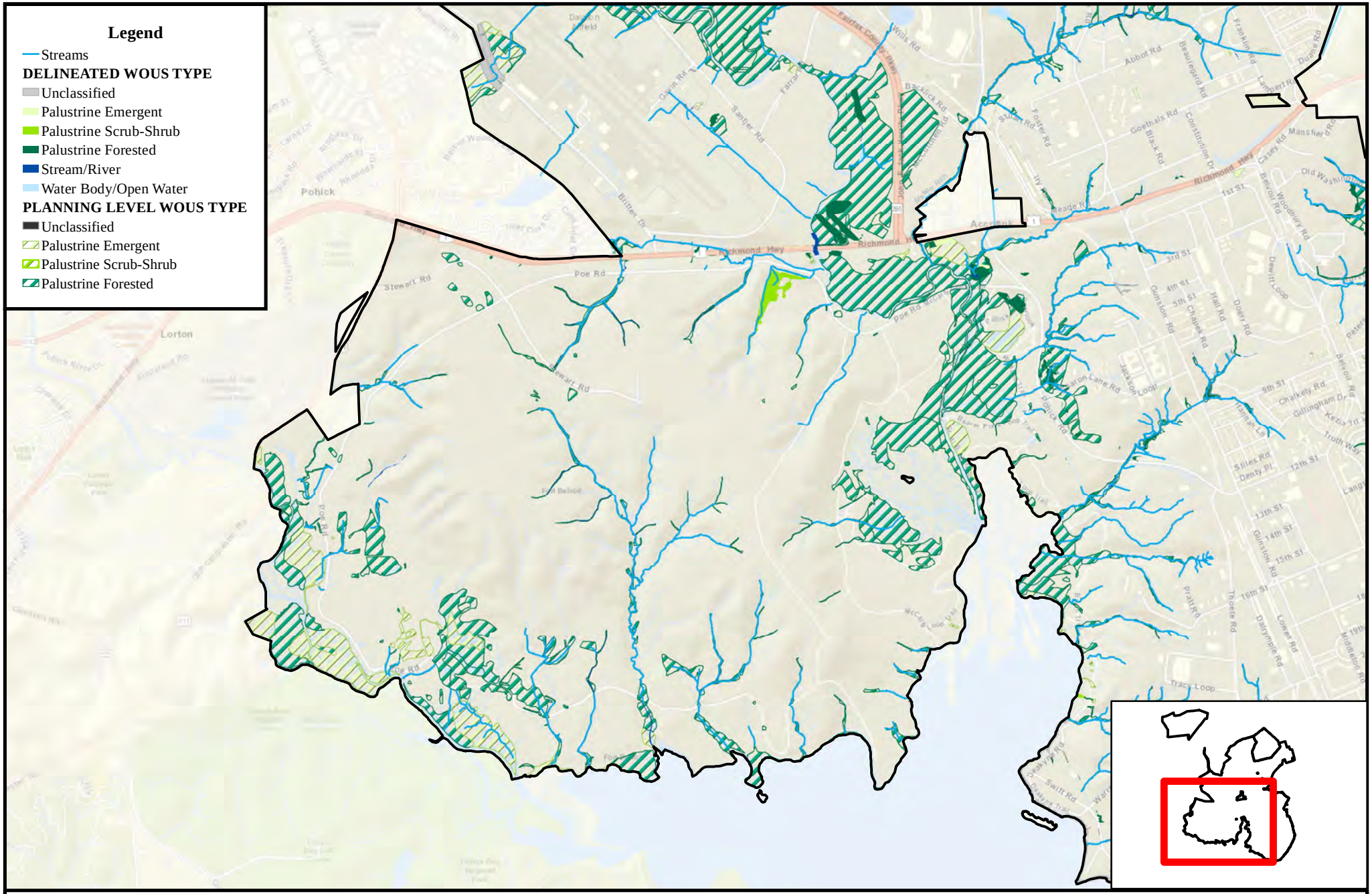

WATERS OF THE US ON FORT BELVOIR, SOUTH WEST

Unclassified // FOUO

Figure 5.9

Source: Fort Belvoir 1997 wetland surveys, additional jurisidictional determinations from 1997-2017, Google road maps

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5.3 WATER RESOURCES MANAGEMENT

5.3.1 Water Resources Recommendations

Fort Belvoir recognizes that streams, impoundments, tidal resources and wetlands are inextricably linked to land conditions and activities throughout the watershed. As a result, Fort Belvoir's water resources management program focuses on a combination of watershed management that impacts both aquatic (e.g., in-stream, tidal) and terrestrial (e.g., wetlands, seeps, ponds, stormwater best management practices) resources in order to achieve a watershed-based management approach which meets the military mission.

Water resources management recommendations evolved out of a necessity to meet regulatory requirements under the CWA. Since the early 2000's, there has been a large regulatory-driven push to address and mitigate wetland impacts. Based on the baseline wetland surveys, it is known that Fort Belvoir possesses extensive areas of wetlands, including wetlands that have high conservation priority. While land disturbance (e.g., construction, land disturbing training, outdoor recreation) represents a direct threat to installation wetland resources, Fort Belvoir's wetland resources are more often vulnerable to disturbance by invasive/exotic species, stormwater (e.g., erosion and sedimentation), problematic wildlife (e.g., beaver (*Castor canadensis)*), and impacts from adjacent land-use developments and activities. Specific management recommendations include the following:

- Monitoring wetlands that have high conservation priority
- Monitoring and controlling invasive vegetation (e.g., *Phragmites*)
- Monitoring and controlling destruction by beaver activity
- Implementing stormwater management actions to control habitat impacts
- Performing hydrologic and water quality assessments of wetland areas and undertaking improvements as needed
- Maintaining a buffer around the Jackson Miles Abbott Wetland Refuge (JMAWR) wetlands
- Characterizing and protecting groundwater quality and flow at the T-17 ravine
- Monitoring changes of existing wetland and water resources

Later in the same decade, stormwater began receiving similar scrutiny for impacts to water resources. The minimum acceptable water quality standards are now more stringent and include quality and quantity measurements, a tracking system, and extensive project reviews. Furthermore, stormwater management requirements under the TMDL Action Plan for Fort Belvoir (March 2016) require the decrease of sediments and nutrients from stormwater in order to meet compliance requirements for improved water quality.

Finally, industrial stormwater management requirements, as defined in the 2017 Industrial Stormwater (ISW) permit for Fort Belvoir, include a similar regulatory-driven push to address deficiencies in this area as a means of improving water quality. There is now a greater accountability for the release of known pollutants which can impact water quality from industrial sources.

Based on the regulatory requirements, improvements to water resources (e.g. streams, tributaries, wetlands) will continue to be addressed with both engineered actions and preventative measures. Fort Belvoir will continue to monitor and address physical habitat loss, bank instability, habitat degradation, erosion, sedimentation, increased flows, and increased flow duration. Likewise, water quality degradation due to transport of pollutants, such as sediments, TSS, TPH, Nitrogen, Phosphorous, hardness and metals, will continue to be monitored and addressed. Specific actions that will be considered and taken, as appropriate, include, but are not limited to, channelization, installation of hardened riprap, planning living shorelines, conducting stream restorations, making green infrastructure improvements, using BMPs, and conducting wetland restoration. These options remain the traditional, scientifically, and industry accepted recommendations to address water resources deficiencies as defined by the various regulations and permits. The efficient use of resources and minimal impact to the military mission will continue to be a top priority.

5.3.2 Water Resources Multiple Use Requirements

DoDI 4715.03, *Natural Resources Conservation Program,* stipulates that installations should allow for multiple uses of their natural resources, including water resources. The use requirements include: realistic military training and testing; conservation; outdoor recreation; environmental education and scientific research and study; and water supply. Fort Belvoir provides for these multiple uses. Land development and facility maintenance are also of particular importance regarding water resources at Fort Belvoir.

Military Training and Testing Requirements

Fort Belvoir has hands-on occupational specific training that sometimes involves water resources. Access to water-based training is controlled and managed through existing shoreline training facilities on post. Training planned to be conducted in areas other than existing training facility locations is reviewed by and coordinated with the DPW-Environmental Division.

Conservation

Conservation of natural resources, including water resources, is a major objective at Fort Belvoir. As stipulated in various regulations, guidance, and policies, conservation is to be considered as a viable means for protection of water resources.

Outdoor Recreation Requirements

The principal outdoor recreation activities involving water resources at Fort Belvoir are fishing, canoeing, kayaking, waterfowl hunting, boating, hiking, nature watching (e.g., bird watching) and nature art (e.g., outdoor photography). The use and enjoyment of water resources by each type of activity is predicated on the water resources being in a healthy condition. Dogue Creek Marina provides engineered shoreline facilities, including a boat launch, boat slips and docks, and a marina building for the use of gasoline-powered watercraft. Watercraft such as canoes, kayaks, and car-top boats can be put in at Tompkins Basin. Hiking trails and fishing piers provide access facilities for fishing, waterfowl hunting, hiking, nature watching, and nature art require much simpler access facilities, such as hiking trails and fishing piers.

Environmental Education and Scientific Research and Study Requirements

Fort Belvoir is an excellent location for environmental education and scientific research and study of water resources. Access to Fort Belvoir's water resources is available via the trail network and boat launch facilities.

Land Development and Facilities Maintenance Requirements

While not specifically addressed in the DoD and Army management policies, land development and facilities maintenance must be considered as one of the multiple uses of installation lands and waters. This is especially true for Fort Belvoir, which as of 2017, supports approximately 150 tenant organizations, approximately 2,070 housing units, a working population of approximately 40,000 and plans to support an additional 17,000 personnel by 2030. The siting, construction, maintenance, and use of these facilities represent the most significant source of potential impact to water resources on Fort Belvoir.

5.3.3 Water Resources Management Actions to Date

Fort Belvoir manages water resources in accordance with the resource conservation and multiple use requirements of DoDI 4715.03 and AR 200-1. Management actions to date have prioritized balancing conservation of water resources with meeting the military mission to support and sustain multiple use of water resources. Fort Belvoir approaches water resources management on a watershed based strategy, consistent with the Chesapeake Bay Program requirements.

Fort Belvoir recognizes promoting regional water resources management by: (1) avoiding any additional impacts to water resources if possible, (2) minimizing impacts to water resources whenever possible, (3) mitigating impacts as required by law, and (4) correcting, either through restoration or enhancement, existing

problems within the watersheds that are entirely within the installation's control, as possible. This is the accepted management process for all projects performed at Fort Belvoir.

Wetland resources in particular receive some of the greatest protection from loss and disturbance typically caused by construction, land disturbing activities, outdoor recreation, and military training or testing activities. In those instances where wetland loss is unavoidable and the action meets the minimum threshold required for the mitigation of impacts, it has been Fort Belvoir policy to mitigate the wetland impact as determined by the corresponding regulatory wetland permit. The desired approach by both the U.S. Army Corps of Engineers, Baltimore District (USACE) and the VDEQ involves the purchase of wetland credits from an approved wetland mitigation bank off site. However, on-site mitigation can be requested and implemented as an alternative.

Water resources that remain naturalized, undeveloped, or have been restored due to regulatory requirements will receive periodic assessment such as invasive species management, habitat analysis, and wildlife studies to ensure water resources remain in an acceptable condition. These resources, are typically found in the installation riparian areas, and throughout the ABWR, Jackson Miles Abbott Wetland Refuge (JMAWR), T-17 Refuge, Fort Belvoir Forest and Wildlife Corridor (FWC), and Accotink Creek Conservation Corridor.

5.3.3.1 Water Resources Conservation Actions

Fort Belvoir works to protect and enhance native aquatic biodiversity and water quality by conserving and enhancing native aquatic habitats, correcting and preventing stormwater-related problems, and protecting against overuse and misuse of aquatic resources (e.g., illegal fishing). To date, Fort Belvoir's water resources conservation actions have taken the following approach:

- Designating key installation areas (i.e., ABWR, JMAWR, T-17 Refuge, FWC, and Accotink Creek Conservation Corridor) as conservation areas in accordance with DoDI 4715.03. (DODI 4715.03 authorizes installations to designate as "Special Natural Areas" specific areas of an installation which have ecological, scenic, recreational, and educational value warranting special conservation efforts, if consistent with the military mission. All conservation area designations since the 1990's were undertaken as mitigation actions under NEPA.
- Performing stormwater improvements (e.g. BMPs) to control and reduce excess flows
- Restoring stream corridors and adjacent, connected, or nearby wetlands
- Performing aquatic habitat restoration
- Implementing and enforcing water resource protection regulations under Section 10, 401, and 404 of the Clean Water Act. Implementing and enforcing state water resources protection regulations under State Water Control Law, Virginia Stormwater Management Act, Virginia Stormwater

Management Program Regulations, and the Virginia Water Protection Permit Program Regulations
- Performing regional coordination with Federal, State, and Local Organizations

Each of these conservation actions is discussed below.

Conservation Area Designation

Fort Belvoir has previously designated five installation areas for conservation as Special Natural Areas: ABWR, JMAWR, T-17 Refuge, FWC, and Accotink Creek Conservation Corridor (Section 9). All of the Pohick Creek, Pohick Bay, lower Accotink Creek and Accotink Bay shorelines on post are included within the ABWR. All of the upper Dogue Creek stream corridor and Mulligan Pond are within the JMAWR. Sections of upper Accotink Creek and Mason Run are within the FWC. T-17 is within Gunston Cove watershed and Accotink Creek Conservation Corridor is within Accotink Creek watershed. (Section 9)

Stormwater Control

Fort Belvoir has been actively addressing failing and improperly functioning stormwater BMP's over the last 15 years. These actions are in response to meeting strict regulatory requirements for water quality in order to protect water resources. Conservation actions typically involve adapting existing storm water features to allow for greater retention of stormwater, increased infiltration to decrease concentrated flows, decreased flow velocities, and adequate stabilization of outfalls leading to water resources. These are some of the many conservation options that stormwater management can utilize to protect water resources.

Water Resources Restoration

Since 1999, Fort Belvoir has been implementing projects to restore water resources, including channels and riparian areas as a key feature of the installation watershed management program. Fort Belvoir began using natural stream design to stabilize highly eroded areas. Some example projects include stream restorations at a tenant facility along Telegraph Road and throughout main post and as part of BRAC 2005 and the main post infrastructure upgrade. Slope stabilization, riparian buffer enhancements, and stream bed restorations were accomplished using innovative in-stream, low-flow channel structures. In addition, new stormwater control structures, such as energy dissipation and flow moderation devices, were installed or existing ones were repaired. Plantings were also done to correct flow problems.

As part of the BRAC 2005 construction, Fort Belvoir began using stream restorations to achieve "adequate outfall" (rather than hardening channels) for stormwater management. Additionally, the privatized improvement of the water

and wastewater systems done as part of a main post infrastructure upgrade has been using natural stream design and channel stabilization techniques to correct situations where in-stream erosion has been threatening existing utility crossings. In total, there are 42 locations which have been identified as appropriate locations for restoration. These locations can be found in this document and in the Real Property Master Plan (RPMP).

Table 5.10 presents a summary of stream mitigation and restoration projects that have been completed or are proposed on Fort Belvoir. Figure 5.10 has the location of some of the water resources restoration and mitigation sites. Not all stream mitigation sites are identified on the map due to rendering issues.

Table 5-10: Water Resources Restoration and Mitigation Projects to Date			
Location	**Sub Water Shed**	**Description**	**Status**
Mason Run Crossing 3	30	Infrastructure improvement for privatized utility	Concept Design
Mason Run Crossing 4	30	Infrastructure improvement for privatized utility	Concept Design
Division Army Airfield	42	Palustrine Emergent Wetland Restoration	Completed
Division Army Airfield	40	Stream Bank Stabilization	Completed
Accotink Creek Accesses Road for Waste Water Utility Area 1	40	Palustrine Forested Wetland Restoration for Impacts at Fairfax Parkway	Completed
Accotink Creek Accesses Road for Waste Water Utility Area 2	40	Palustrine Forested Wetland Restoration for Impacts at Fairfax Parkway	Completed
Accotink Creek Accesses Road for Waste Water Utility Area 3	40	Palustrine Forested Wetland Restoration for Impacts at Fairfax Parkway	Completed
Troth Way and Farrell Road	24	Stream Restoration	Completed
Accotink Creek next to John J. Kingman Road	40	Bank Stabilization	Completed
Surveyor Road	25	Mitigation	Completed
Hospital, Warrior Transition Unit, 6th Street	3	Mitigation	Completed
Fort Belvoir North Area	53G	Mitigation	Completed
Herryford Village	3	Rear Property Master Plan Mitigation	Completed
Meade Road	29	Rear Property Master Plan Mitigation	Completed
North Area	53	Restoration	Completed
Pohick Road	03	Stream Restoration	Completed
Totten Road	14	Rear Property Master Plan Mitigation	Permitting

Table 5-10: Water Resources Restoration and Mitigation Projects to Date			
Location	**Sub Water Shed**	**Description**	**Status**
Tracy Loop Pond Stream	5	Rear Property Master Plan Mitigation	Permitting
Gillespie and Hurley Roads	22	Rear Property Master Plan Mitigation	Proposed
Behind Dewitt Hospital	24	Rear Property Master Plan Mitigation	Proposed
Between 1st and 3rd Street	1	Rear Property Master Plan Mitigation	Proposed
Tracy Loop South	6	Rear Property Master Plan Mitigation	Proposed
Between Marrow Road and Tracy Loop	6	Rear Property Master Plan Mitigation	Proposed
Patrick Beach	18	Rear Property Master Plan Mitigation	Proposed
Jackson Loop South	2	Rear Property Master Plan Mitigation	Proposed
Jackson Loop North	2	Rear Property Master Plan Mitigation	Proposed
Old Washington Road	26	Rear Property Master Plan Mitigation	Proposed
Woodlawn Road	32	Rear Property Master Plan Mitigation	Proposed
Golf Course Reach of Mason Run	38	Rear Property Master Plan Mitigation	Proposed
Gunston and Pohick Stream	01	Stream and Wetland Restoration	Proposed
Stream at NMUSA	38	Rear Property Master Plan Mitigation	Design
Sharon Lane Road	2	Rear Property Master Plan Mitigation	Proposed
American Water Stream Crossing 5	22	Infrastructure Improvement	Completed
American Water Stream Crossing 7	24	Infrastructure Improvement	Completed
American Water Stream Crossing 8	25	Infrastructure Improvement	Completed
American Water Stream Crossing 2	19	Infrastructure Improvement	Design and Permitting

Table 5-10: Water Resources Restoration and Mitigation Projects to Date			
Location	**Sub Water Shed**	**Description**	**Status**
American Water Stream Crossing 3	21	Infrastructure Improvement	Design and Permitting
American Water Stream Crossing 4	22	Infrastructure Improvement	Design and Permitting
American Water Stream Crossing 6	24	Infrastructure Improvement	Design and Permitting
Tenant along Telegraph Road	33	Stream Restoration	Completed
Tenant along Telegraph Road	33	Stream Restoration/ Stream Stabilization	Construction
300 Military Boat Ramp	13	SAV planting in intertidal zone	Completed

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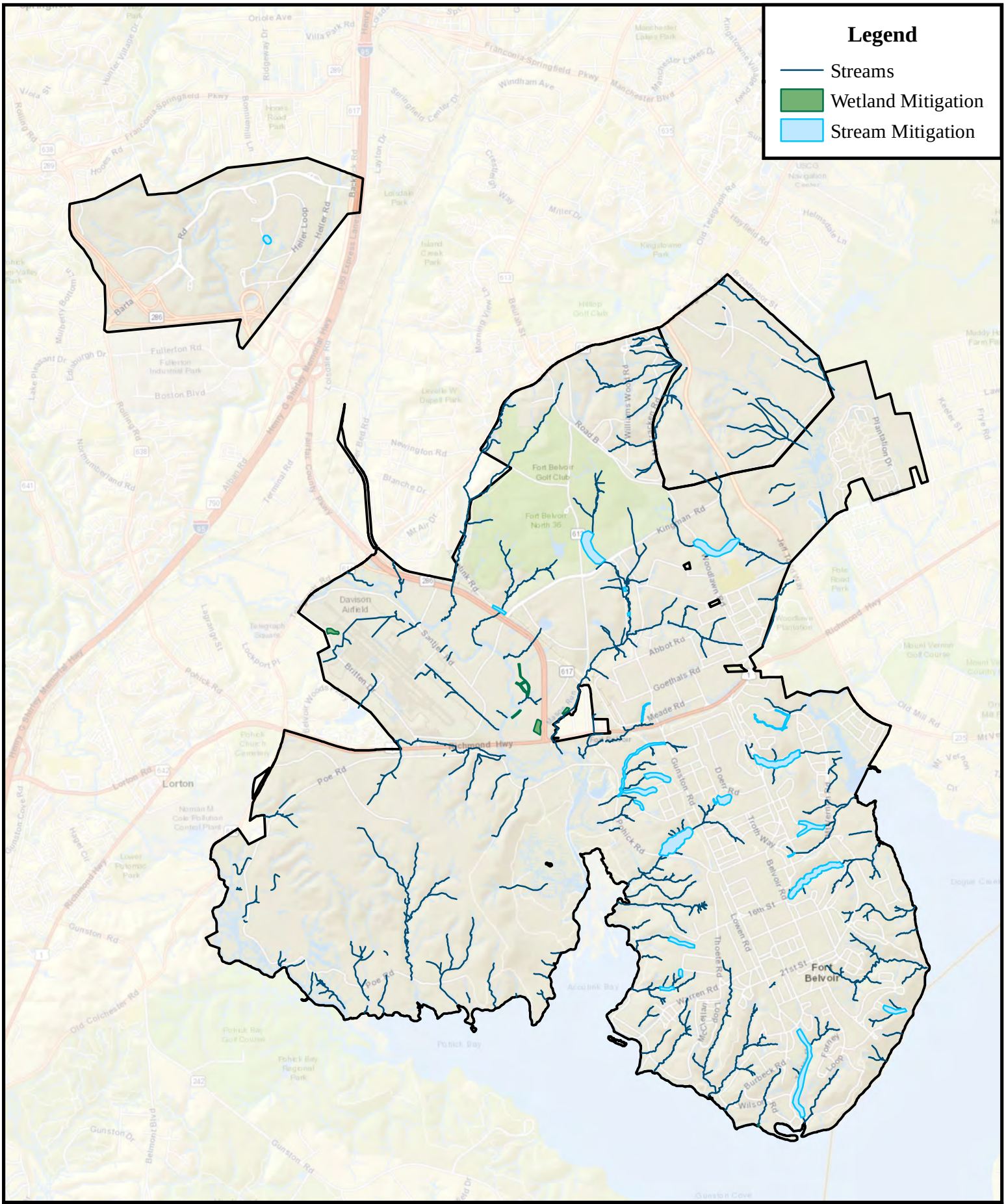

STREAM AND WETLAND MITIGATION ON FORT BELVOIR

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Figure 5.10

Source: Fort Belvoir GIS, Google road maps

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Aquatic Habitat Enhancement

Aquatic habitat on Fort Belvoir has previously received little consideration. However, changes in regulatory guidance and permitting now allows for more types of aquatic habitat enhancements. Aquatic habitats found at Fort Belvoir include three installation ponds: the 2-acre Mulligan Pond in the JMAWR, the less than one-acre pond on the North Post Golf Course, and the less than one-acre stormwater pond on the Army Intelligence and Security Command (INSCOM) facility. Additional aquatic habitat can be found along the stream banks of Dogue Creek, Accotink Creek, Pohick Creek, Accotink Bay, and the Potomac River.

One aquatic habitat enhancement project was performed in the last five years. This project entailed correcting bank erosion and planting riparian vegetation along the INSCOM pond shore to improve the values and functions of the ecosystem while also mitigating stormwater impacts.

Enforcement of Water Resource Protection Regulations

Regulatory policies under various federal and state regulations provide the most comprehensive management directives to date. WOUS are fully protected under these policies, which guide and encourage any development, discharge, restoration, or enhancement at Fort Belvoir. As of 2017, Fort Belvoir has over 30 various permits that stipulate how water resources are to be protected and managed.

Regional Coordination

Fort Belvoir continues to work with stake holders and neighbors to coordinate watershed GIS mapping. Fort Belvoir's Special Agent (responsible for Conservation Law Enforcement on post) provides support to federal and state agents on investigative and enforcement actions regarding water resources within the region.

5.3.3.2 Wetlands Survey Updates

The baseline wetlands inventories that were conducted in 1997, have been continually updated. The update process occurs in one of two ways. The predominant method involves wetland delineations that are prompted by proposed projects that will disturb areas that are semi-improved, un-improved areas or have known water resources. Upon the completion of a wetland delineation, the corresponding information is provided to the GIS department in order to update the existing baseline wetland layer that Fort Belvoir maintains.

The second method involves performing either visual and/or hands-on monitoring of wetland sites identified in the baseline wetland inventory. The visual monitoring involves performing a wetland walk-over to quickly identify

wetlands limits and wetland type. The hands-on monitoring involves performing a more in-depth determination of wetlands limits, wetlands type, and wetland functions. Both the visual and hands-on monitoring should be completed by the on-site wetland professional or other qualified individual as determined by the Wetlands Program Manager or contractor.

5.3.3.3 Wetlands Protection

The majority of the installation's wetland area is included in 5 designated "Special Natural Areas". The RPMP identifies these areas, as well as wetlands outside the Special Natural Area boundaries, as environmentally constrained, thereby encouraging future development to avoid wetland areas. The NEPA Record of Decision (ROD) for the RPMP (U.S. Army, 2016) indicates that wetland impacts are expected to be less than 0.09 percent of the total estimated wetlands on post.

These land-use designations as well as a broad understanding of wetland values and functions have been effective at safeguarding installation wetlands from loss to development or installation operations. As such, many projects result in only temporary wetland impacts that are restored at the completion of the project.

5.3.4 Wetlands Enhancement

Fort Belvoir addresses conservation and enhancement of native biodiversity within ecological communities, to include wetland communities, by identifying and controlling threats from invasive/exotic species, stormwater-related problems, problem wildlife, and cumulative and human impacts (i.e., direct and indirect development).

As addressed in Section 6.3.8.2 Fort Belvoir has an invasive/exotic vegetation management program. The first invasive/exotic vegetation management actions in wetlands on Fort Belvoir were undertaken in 1999 in an effort to control *Phragmites australis* (phragmites) in Accotink Bay and Dogue Creek. Since then, Fort Belvoir has and continues to manage numerous invasive/exotic species to include the periodic spot treatment of invasive vegetation such as, but not limited to, oriental bittersweet (*Celastrus orbiculatus*), marsh dewflower (*Murdannia keisak*), and wineberry (*Rubus phoenicolasius),* treatment of habitat restoration projects, and treatment in Fort Belvoir's Special Natural Areas with a special emphasis on the ABWR.

As stated previously, Fort Belvoir has implemented a watershed-based management approach that addresses restoration by correcting stormwater-related problems within installation stream corridors, and implementing BMPs to safeguard against future problems. In selecting locations for watershed restoration projects, Fort Belvoir has emphasized watersheds associated with the sensitive lower Accotink Creek-Accotink Bay wetlands as well as projects which

will help Fort Belvoir meet TMDL goals. The first project, completed in 1999, addressed subwatershed 03, which drains to refuge area JMAWR. The latest stream system to be restored is in the Accotink Creek Watershed and has led to a reduced load in sediments. As of 2017, there were four other streams on post that are being reviewed for improvement in order to help Fort Belvoir meet TMDL requirements and one stream that is currently being actively restored in North Post, within the Dogue Creek watershed.

5.4 CONTINUING AND FUTURE WATER RESOURCE MANAGEMENT

Fort Belvoir intends to continue the management emphasis and actions addressed in Section 5.3. The installation will continue management for a no net loss of wetlands and WOUS, as well as to enhance and restore wetlands and WOUS that support the military mission, enhance biodiversity, and as required by regulation and DoD guidance. Fort Belvoir will continue to conserve and enhance native water resources, while providing balance among the multiple legitimate uses and users such as construction or other land disturbing activities, land development, and military training. Continued support of military training and testing will take primacy. After that, management emphasis will be on conservation and enhancement of water resources in accordance with established DoD and DA natural resources management policies, as well as stewardship programs, such as the Chesapeake Bay Program.

Fort Belvoir recognizes that the most significant threats to local water resources today arise from stormwater related problems and land development. Consequently, Fort Belvoir will emphasize actions to correct and prevent stormwater related problems; implement management actions, such as invasive/exotic species management and problem wildlife management to restore degraded stream corridors and riparian areas; and restore aquatic habitats using living shorelines and other green infrastructure to improve resilience of both manmade and natural infrastructure. Fort Belvoir will consider the potential for impacts to WOUS when making land-use and operational decisions, and will continue to mitigate all unavoidable WOUS losses and impacts consistent with the requirements of the Chesapeake Bay Program, VDEQ, USACE, and USEPA.

Fort Belvoir will continue to provide the public opportunities to access installation waters for recreation and for conservation education and scientific research and study, consistent with resource conservation goals, military mission and operations and security requirements.

5.4.1 Water Resources Management Directives

1) Provide access to meet military training and testing requirements.
2) Protect against loss or degradation of native diversity of aquatic resources, as defined by Environmental Assessment (EA) (1999a, 2000); Ernst et al. (1995); Jones and Kelso, (1998, 1999), and Hobson (1996, 1997).
3) Conserve and enhance water resources that have been prioritized for conservation by the Chesapeake Bay Program, the Virginia Natural Heritage Program, and the American Heritage Rivers Program.
4) Protect, enhance, and restore native aquatic habitat by correcting existing stormwater or development-related problems, preventing future stormwater-related problems, and utilizing green infrastructure techniques, such as living shorelines to both restore aquatic habitats as well as increase climate resilience of Fort Belvoir.
5) Evaluate comparable improvements of water resources to determine impacts of management actions on conservation and restoration activities.
6) Create a Watershed Management Plan, which utilizes information from various resource and compliance departments to make management and restoration decisions.
7) Provide opportunities for public access for recreation and environmental education and study consistent with resource conservation and military mission.

5.5 WATER RESOURCES MANAGEMENT GOALS, STRATEGIES, AND OBJECTIVES

5.5.1 Projects

Proposed activities that are considered Projects in this INRMP are activities that may potentially impact the environment and would need to be evaluated for the appropriate level of NEPA documentation. The following goals contain Projects within their objectives or strategies:

Goal 1: Continue to obtain scientific information on installation water resources.

- ***Objective***: Support our knowledge of biodiversity, to identify stressors and detect changes to biodiversity, and to evaluate the effectiveness of management actions.
- ***Strategy***:
  1) Perform surveys of wetlands most likely to be impacted as well as a year round surveillance (i.e., close observation in lieu of studies or monitoring projects) of other wetlands to detect changes, and potential activities which could impact wetland conditions. Apart from obvious physical conditions (e.g., sediment build-up, beaver activity, human degradation etc.), stress and changes in biodiversity will be inferred from changes in vegetation conditions.

2) Develop and implement a program to monitor conditions within the high-rarity ranked wetland communities, as recommended by the Department of Conservation and Recreation-Natural Heritage Program (DCR-NHP). Coordinate with DCR-NHP to develop and implement the monitoring program.
3) Perform monitoring of a representative sample annually of in-stream fish and/or benthic communities consistent with the protocol established by the baseline aquatic inventory.
4) Perform year-round surveillance (i.e., close observation, in lieu of studies or monitoring projects) of aquatic systems to detect disruptions and/or locations where threats (e.g., sedimentation, invasive species) are affecting resource integrity.
5) Perform an annual survey (addressing sedimentation, erosion, water quality, etc.) of a representative sample of installation waterways to assess changes within the stream corridors, and evaluate the success of management/corrective actions required for the annual watershed monitoring report (Survey one restored stream and five unrestored streams per year).
6) Update and maintain baseline information in installation documents, records, databases, GIS, etc.
7) Identify opportunities for stream restoration, riparian buffer restoration/enhancement, wetland restoration/enhancement, etc.
8) Develop and implement protocols for localized and/or issue-specific water resources surveys and studies, as needed for specific projects such as new development, or for mission activities.

Goal 2: Establish baseline inventory of marine systems along the Fort Belvoir shoreline.

- ***Objective***: Utilize scientific and industry accepted methodologies to collect and present relevant information on water resources.
- ***Strategy***:
  1) Develop and implement a protocol for yearly assessments of the Accotink Bay, Gunston Cove, Dogue Creek, Potomac River and Pohick Bay.
  2) Utilize geospatial tools and resources, field surveys, sampling, and GIS data layer development to perform an inventory update and analysis on aquatic resources to include submerged aquatic vegetation, mollusks, anadromous fish, benthic organisms, water quality, etc.
  3) Perform comparisons of existing inventory reports to determine if changes in the water resources is responding to management actions.

Goal 3: Update the watershed planning level survey (PLS), to include an assessment of land use/cover and installation activities.

- ***Objective***: Utilize a Watershed Inventory for Vulnerability Assessment (WIVA) or other industry accepted practices; WIVA is a GIS based integration of chosen natural resources characteristics and land use/cover for the watershed analysis.

- ***Strategy***: Create metrics or variables that quantify health and stressors affecting the watersheds found on the installation.

Goal 4: Update the wetland PLS.

- ***Objective***: Update and improve resolution of planning level wetlands data currently used in wetlands baseline survey, and revise wetland acreage, location and boundaries on Fort Belvoir.
- ***Strategy***:
  1) Utilize geospatial platforms and GIS; Landsat data will be used in conjunction with Phased Array type L-Band Synthetic Aperture Radar (PALSAR) instrument on the Japan Aerospace Exploration Agency and Ministry of Economy, Trade and Industry Advanced Land Observing Satellite (ALOS) in order to distinguishing various wetland types. Alternative methodology may be used to improve accuracy of analysis.
  2) Perform comparison among wetland inventories to identify the percent and acreage changes in wetland resources every five years.
  3) Perform field surveys, field verifications, photo-interpretation, and wetland characterization to verify accuracy of 5-year wetland inventory update.
  4) Ensure the GIS wetland inventory update has an 85% match rate to field surveys, field verifications, photo-interpretation, and wetland characterization.
  5) Utilize historic aerial photography to date, and interpret the wetland boundaries for each decade to forecast future impacts on ecologically valuable ecosystems. A comparative analysis of the change in wetland location and type will be performed.

Goal 5: Continue to protect against loss of native diversity and ecosystem function of Fort Belvoir's water resources.

- ***Objective***: Conserve areas of ecologically significant water resources as stipulated by regulatory requirement, mitigation commitment, or that have been prioritized for conservation, such as extensive wetland areas.
- ***Strategy***: Identify areas of ecologically significant water resources, consistent with DoDI 4715.03 policy for designating specific areas of the installation that warrant special conservation as "Special Natural Areas" (see Section 9) if consistent with the military mission. Maintain designation of the five existing SNAs as environmentally constrained to development under the RPMP, and warranting conservation considerations in other installation plans and documents. Designate new SNAs where legally obligated to do so.

Goal 6: Continue the long-term stream corridor restoration projects listed in the RPMP.

- ***Objective***: Restore natural conditions to streams that have been identified in the RPMP and its NEPA ROD for restoration.
- ***Strategy***: Perform the necessary assessments, designs, permitting, and construction of stream restoration projects.

Goal 7: Continue to assess opportunities and, as possible and practicable, begin to restore aquatic habitat, WOUS, and other water resources.

- ***Objective***: Utilize Nationwide Permits for wetland, stream, green infrastructure, and living shoreline restorations for possible TMDL credits.
- ***Strategy***: Evaluate three water resources per year which could be considered for restoration.

Goal 8: Continue to improve the incorporation of the Chesapeake Bay Program and the Chesapeake Bay Act with existing water resources and wetland protection.

- ***Objective***: Protect riparian buffer areas by directing water-based training activities (military and civilian) and water-based recreational activities to designated areas.
- ***Strategy***:
  1) Create a Fort Belvoir Policy that defines the riparian buffer width for all installation waterways. Address the regulatory-driven RPA as well as Fort Belvoir's 35 foot buffer on intermittent streams.
  2) Continue to update Water Resources maps and information to include RPAs.
  3) Determine stream perenniality of 10 streams per year to keep RPA information updated and identify the limits of protection in the field.

5.5.2 Actions

Actions are those activities that do not require ground breaking or environmentally altering activities. The following goals include Actions in their objectives or strategies:

Goal 9: Continue to enforce federal and state laws and regulations applicable to Fort Belvoir, as well as DoD, DA, and Fort Belvoir natural resources policies.

- ***Objective***: Ensure Fort Belvoir remains in compliance with all applicable water resources laws and policies.
- ***Strategy***:
  1) Perform water resources compliance inspections on a regular schedule to ensure compliance.
  2) Perform inspections in support of enforcement actions

Goal 10: Assess potential changes to wetland and water resources from climate impacts.

- ***Objective***: Utilize geospatial tools and GIS data to determine potential impacts as well as possible responses.
- ***Strategy***: Create forecast trends and models to improve watershed management strategies (e.g., migration of wetlands due to changing sea level, effectiveness of green infrastructure in protecting wetlands and mitigating storm surges, impacts of development and invasive species on wetland resources).

Goal 11: Continue to incorporate water resources protection requirements into all mission actions.

- ***Objective***: Assist in meeting mission requirements.
- ***Strategy***:
  1) Use the installation's review processes (Section 3.6) to incorporate water resources protection requirements into all phases of facilities siting, construction, renovation, operation, maintenance and demolition activities; military training and testing activities; outdoor recreation; environmental education; scientific research and study; and all other types of land area access and use requests.
  2) Perform project reviews for all projects.
  3) Include water resources protection, in particular wetlands and WOUS, as part of the Excavation Permit and Demolition Permit review processes.
  4) Include water resources protection in all real estate actions (e.g., outgrants, leases, rights-of-entry), as appropriate.
  5) Coordinate with other entities performing aquatic studies and management actions in and around the Fort Belvoir area.
  6) Review and revise the Fort Belvoir environmental protection specifications applicable to construction projects to ensure that they include appropriate water resources protection, as needed.

Goal 12: Continue an educational outreach program to highlight the importance of water resources, including wetland ecosystems.

- ***Objective***: Increase the education and awareness level for the on-post public.
- ***Strategy***:
  1) Develop field educational materials and/or field trips similar to a living classroom that can be utilized by schools and other groups as appropriate, and to educate the general public.
  2) Identify and provide opportunities for specialized training in innovative water resources management techniques for garrison, partner, tenant and contractor personnel, as appropriate.
  3) Participate in educational and service events pertaining to watershed and water resources, such as the annual Potomac River shoreline clean-up.
  4) Write and publish articles on water resources.

Goal 13: Continue to manage natural resources information so it is accessible to, and can be used by, installation natural resource managers.

- ***Objective***: Develop and implement a water resources database. Keep installation GIS up to date.
- ***Strategy***:
  1) Develop a system for storing and managing data.
  2) Enter electronic data.
  3) Scan and upload paper records.

Goal 14: Continue to work with the installation GIS and IT offices to bring on-line the wetlands permit database.

- ***Objective***: Update wetland database by scanning all relevant information on wetland resources currently stored in the Environmental Division library associated with wetland classification, jurisdictional determination, wetland permitting, and wetland mitigation.
- ***Strategy***: Secure space on DPW server for dedicated wetlands database.

Goal 15: Create a revised comprehensive watershed management approach that integrates all components of water resources into one management tool capable of incorporating information from other resources areas, and that can be used to make future management decisions for entire watersheds. The watershed management approach will be an ongoing cycle of tasks that can include, but is not limited to, setting standards for surface water quality, taking measurements of watershed conditions, assessing various types of data, identifying impairments to establishing priorities, verifying pollution sources, developing plans for restoring water quality, and implementing pollution source controls.

- ***Objective***: Decide on a layout and management policies to include and utilize the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management stipulated in the Federal Register.
- ***Strategy***: Work with Conservation and Compliance branches of DPW Environmental Division to determine what factors should be considered for revised comprehensive watershed management approach.

Goal 16: Continue to provide technical assistance in emergency situations, such as fuel spills, that threaten wetland and other water resources.

- ***Objective***: Ensure emergencies are responded to in a timely manner while meeting all regulatory requirements.
- ***Strategy***: Inspect and provide guidance.

Goal 17: Continue to perform agency coordination, notification and permitting on installation actions within or potentially affecting wetlands.

- ***Objective***: Provide support to investigation and enforcement of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.
- ***Strategy***:
    1) Coordinate with USACE and VDEQ for Clean Water Act Section 404 Permit actions, and for Rivers and Harbors Act Section 10 Permit actions.
    2) Coordinate with VMRC and the VDEQ for Virginia Subaqueous Bed Permit actions, and with the Water Control Board for Water Protection Permit actions.
    3) Coordinate with Fairfax County Wetlands Board for Fairfax County Wetlands Permit actions.
    4) Coordinate with USFWS, National Marine Fisheries Service, Virginia Department of Game and Inland Fisheries, and other agencies as appropriate, on all wetland permit actions.

5) Develop and implement mitigation projects required by wetland permits. Perform corrective actions, as needed. Perform all reporting to agencies, as required by permit.
6) Coordinate with VDGIF, DCR-NHP, Northern Virginia Soil and Water Conservation District, Chesapeake Bay Program Office, and other appropriate entities regarding stewardship recommendations for water resources.
7) Develop and participate in partnerships for water resources conservation with Fairfax County and other regional entities. Address watershed management, point and nonpoint source runoff, storm-water management, fisheries management, invasive/exotics management, public access, and environmental education. Assess opportunities for grey water use.

Goal 18: Continue to issue installation-specific policies and guidance documents.

- ***Objective***: Provide direction and guidance for projects and activities that may impact water resources.
- ***Strategy***: Develop and maintain policy memorandums regarding water resources, as needed. Maintain current guidance on wetland permitting and RPA/buffer protection. Develop a comprehensive riparian buffer policy.

6.0 VEGETATION

Vegetated areas perform a host of ecological functions and support multiple societal, economic, quality of life, and aesthetic values in addition to providing military mission support. Maintaining a healthy native vegetation cover is essential for ensuring the future availability of land and water resources for military training and testing, providing for sustained multiple uses of an area's natural resources (e.g., opportunities for outdoor recreation and scientific research and education), and ensuring a high quality of life for personnel. Maintaining a healthy native vegetation cover is also an integral part of protecting water quality, enhancing watersheds and fish and wildlife habitat, and is essential for conserving biodiversity.

Plant communities are dynamic systems, influenced by natural and human forces. Consequently, management actions must be based not only on knowledge of the plant species comprising the community, but also on an understanding of the physico-chemical factors and forces acting on the community (e.g., hydrology, soil chemistry) and the interrelationship of the plant communities with associated wildlife communities. Natural resource managers must be vigilant to detect changing conditions, and must be able to discern between plant community changes due to the natural dynamics of the system and changes due to disruptions in the natural dynamics. Because the ecological functions of plant communities are influenced by their positions within the larger landscape, natural resource managers must understand and consider the larger landscape context within which the communities are situated.

Fort Belvoir's surrounding local area (metropolitan Washington DC area) and regional area (Chesapeake Bay region) continue to experience rapid conversion of undeveloped natural areas to developed land uses. Throughout the local and regional areas, large tracts of native vegetation are being lost or fragmented, with the consequent impacts on watersheds, water quality, and fish and wildlife habitat. As development replaces open space, vegetation in the remaining undeveloped areas is increasingly subject to disruption by invasions of exotic vegetation, stormwater-related erosion and sedimentation, overuse by humans, and overbrowsing by wildlife.

A large portion (about 60%) of Fort Belvoir (Main Post and FBNA combined) is undeveloped and supports predominantly forest communities. The other major native vegetation community types are tidally flooded marsh and scrub-shrub communities. Within the metropolitan Washington DC area, Fort Belvoir represents a significant tract of native vegetation in terms of size, diversity, and position relative to the location of off-post tracts of native vegetation.

Within Fort Belvoir's Main Post, areas of native vegetation occur in large blocks, aligned from the northeast to the southwest. This linear configuration affords a contiguous band of wildlife habitat through the installation, and provides for

connection with wildlife habitat areas outside the installation. Vegetation cover in the remaining 40% of Fort Belvoir consists primarily of the improved grounds associated with the installation's developed land uses including administrative, housing and community service facilities, developed training areas, a golf course, and other recreational facilities. Management actions in the improved areas focus on maintaining aesthetics and function. Management generally includes landscaping, turf management, and urban tree management.

Urban forestry and the landscaping of developed areas can affect both the quality of life for Fort Belvoir residents and the quality of the natural resources on Fort Belvoir. On the installation, a campus quad appearance is maintained on the South Post Core Area, and clustered development on the Upper North Post is designed to preserve large areas of open space (Woolpert, 1995). While aesthetics are an important concern to this installation, it is desirable and possible to manage vegetation in developed areas with sound stewardship principles in mind. The management of developed areas on Fort Belvoir can result in energy conservation; preservation of historic and specimen trees; grounds maintenance cost savings; beautification and increased property values; improved living and working conditions; soil conservation; enhancement of water supplies, runoff and nonpoint sources of pollution control; and good land stewardship.

Natural plant communities that are located within the developed areas of Fort Belvoir provide numerous benefits to people and wildlife. They can serve as valuable islands of habitat for common wildlife associated with urban areas. In areas where plant communities are contiguous, they may serve as small corridors for migratory species that pass through developed areas. Vegetation in these areas helps reduce the ambient air temperature, thus reducing energy costs during the warmest months and providing a more pleasant living environment. Trees absorb sunlight, preventing the ground from excessively heating, and they cool the air directly through evapotranspiration. Vegetation is valuable within developed areas because of beneficial effects on pollution. Grassy areas can reduce and retain stormwater flow from impervious surfaces like roofs and parking lots, while also filtering out pollutants such as toxins and nutrients. Vegetation also provides cleaner air by absorbing carbon and some pollutants.

Native vegetation areas on developed land often require little or no management, and therefore can effectively reduce the amount of pesticides and herbicides applied. These areas can also provide varied opportunities for recreation, thus improving quality of life for residents and visitors. Fort Belvoir, like many other military installations nationwide, represents an area of ecologically significant native vegetation resources within an increasingly urban setting. The continued presence of such islands of natural habitat is critical to conservation of native plant species and communities at the local, regional, and even national levels.

The DoD and the Army acknowledge their responsibility for natural resources conservation in their policies and regulations (Section 9.1), and have successfully demonstrated that not only is it possible to conserve native

vegetation resources while performing the military mission, but that the ability to continue to provide realistic military training and testing in the future depends upon doing so.

6.1 VEGETATION POLICIES

6.1.1 Federal Vegetation Policy

There is no overarching federal law regarding protection of non-threatened or non-endangered vegetation. (Federal endangered and threatened species policy is addressed in Section 8.1) There are, however, a number of federal statutes and directives with requirements pertaining to vegetation. These include the following:

- ***The Sikes Act: (16 USC Section 670a, et seq.) as amended in the Sikes Act Improvement Act of 1997***
  The Sikes Act Improvement Act *Chapter 5C-Conservation Programs on Government Lands* (16 USC 670a.) Section (a) (3) requires military installations to carry out a program, "consistent with the use of military installations …to provide for (i) the conservation and rehabilitation of natural resources on such installations; (ii) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping and non-consumptive uses; and, (iii) subject to safety requirements and military security, public access to military installations to facilitate the use."

- ***The Federal Noxious Weed Act of 1974 (7 USC §§ 2801-2814)***
  This act prohibits the import or movement of nonindigenous weeds that have the potential to interfere with the growth of useful plants, clog waterways, interfere with navigation, cause disease, and that generally are detrimental to agriculture, commerce, and public health, unless pursuant to a permit. The Act prohibits the sale, purchase, barter, exchange, taking, or giving of a noxious weed in violation of the Act. The Act also requires each federal agency to develop a management program to control undesirable plants on federal lands when a similar state program is in place. Where applicable, federal agencies are to enter into cooperative agreements with state agencies to coordinate the management of undesirable plant species on federal lands.

- ***Executive Order 13112, Invasive Species (February 3, 1999)***
  Executive Order 13112 requires federal agencies to work to prevent introductions of invasive plants, control and monitor detected populations of invasives, restore native species and habitats affected by invasives, and promote public education on invasive species and their control.

- ***Presidential Memorandum, Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds, dated April 26, 1994, and the related guidance (60 FR 40837, August 10, 1995)***
  This guidance requires federal agencies to implement environmentally and economically beneficial landscaping practices, including the use of regionally native plants for landscaping and implementation of construction practices that minimize adverse effects on the natural habitat.

- ***Executive Order 13148, Greening the Government through Leadership in Environmental Management (April 22, 2000)***
  This executive order provides a timeframe by which federal agencies must incorporate the *Guidance for Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds* (August 10, 1995) into landscaping programs, policies, and practices. This Order contains overarching direction regarding management of vegetation in developed areas. The order directs federal agencies to strive to promote the sustainable management of federal facility lands through the implementation of cost-effective, environmentally sound landscaping practices, and through programs to reduce adverse environmental impacts. The Order requires agencies to incorporate the Guidance for the 1994 *Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds* into landscaping programs, policies, and practices (60 Fed. Reg. 40837). This memorandum directs agencies to adopt the following principles where cost-effective and to the extent practicable:
    - Use regionally native plants for landscaping.
    - Design, use, or promote construction practices that minimize adverse effects on the natural habitat.
    - Seek to prevent pollution by, among other things, reducing fertilizer and pesticide use, using integrated pest management techniques, recycling green waste, and minimizing runoff.
    - Implement water-efficient practices, such as the use of mulches, efficient irrigation systems, audits to determine exact landscaping water-use needs, and recycled or reclaimed water and the selecting and siting of plants in a manner that conserves water and controls soil erosion. Landscaping practices, such as planting regionally native shade trees around buildings to reduce air conditioning demands, can also provide innovative measures to meet the energy consumption reduction goal established in Executive Order No. 12902, "Energy Efficiency and Water Conservation at Federal Facilities."
    - Create outdoor demonstrations incorporating native plants, as well as pollution prevention and water conservation techniques, to promote awareness of the environmental and economic benefits of implementing this directive. Agencies are encouraged to develop

other methods for sharing information on landscaping advances with interested non-federal parties

- ***The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) (7 USC 136 et seq.)***
  This act affords vegetation protection by emphasizing pest management using biological, cultural, chemical, and physical tools in a manner that minimizes economic, health, and environmental risks.

- ***The Plant Quarantine Act (7 USC 15 1-164a, 167)***
  The Plant Quarantine Act calls for the Animal and Plant Health Inspection Service (APHIS) to regulate the importation and interstate movement of nursery stock and other plants that may carry harmful pests and diseases.

- ***The Federal Plant Pest Act (7 USC 150aa-150jj)***
  This act prohibits the movement of plant pests from a foreign country into and through the U.S., unless permitted by the Secretary of Agriculture. The APHIS has broad authority to inspect, seize, quarantine, and destroy potentially harmful plant and animal materials.

- ***The Organic Act of 1944 (7 USC 147a, 148, 148a-e)***
  This act authorizes the APHIS to detect, eradicate, suppress, control, prevent, or retard the spread of plant pests.

- ***The Plant Protection Act of 2000***
  This act consolidates and modernizes all major statutes pertaining to plant protection and quarantine (e.g., Federal Noxious Weed Act, Plant Quarantine Act) and permits APHIS to address all types of weed issues. It also authorized APHIS to take both emergency and extraordinary emergency actions to address incursions of noxious weeds.

- ***The National Historic Preservation Act of 1966 (54 USC 300101 et seq.) and 36 CFR Part 800***
  This act addresses the protection of historic properties, including historic landscapes. The maintenance and preservation standards of historic landscapes are determined by the Secretary of the Interior.

6.1.2 State Vegetation Policy

Virginia has no overarching law regarding protection of non-threatened or non-endangered plant species and communities. (State endangered, threatened and rare species policy is addressed in Section 8.1). There are, however, a number of Virginia laws and policies addressing vegetation.

- ***The Virginia Noxious Weed Law (Code of Virginia, Title 3.1, Chapter 17.2)***
  This law relates to plants and seeds used in restoration or landscaping. This law prohibits the movement, transport, delivery, shipment, or offering for shipment into or within Virginia of any noxious weed, without a permit from the Commissioner of Agriculture and Consumer Services. A number of related guidance documents and fact sheets have been issued by the Virginia Department of Conservation and Recreation – Natural Heritage Program (DCR-NHP); for example, Natural Heritage Technical Report 98-25, *Managing Invasive Alien Plants in Natural Areas, Parks, and Small Woodlands*; Virginia Natural Heritage Program Fact sheet, *What are Invasive Alien Plant Species and Why are They a Problem?*; and, Virginia Natural Heritage Program Fact sheet, *Invasive Alien Plants List.*

- ***The Virginia Pesticide Control Act (Code of Virginia, Title 3.1, Chapter 14.1)***
  This act confers powers and authority on the Virginia Pest Control Board to develop regulations that restrict or prohibit the sale or use and disposal of any pesticide or pesticide container or residuals that are toxic or hazardous to humans or wildlife, or may adversely affect the environment.

- ***Fort Belvoir's VPDES Small MS4 Permit (VAR040093) dated 1 July 2013 – 30 June 2018***
  This permit requires the development and implementation of turf and landscape nutrient management plans on all lands where nutrients are applied to a contiguous area of more than one acre (9VAC25-890-40, Section II.B.6.c. Turf and Landscape Management) under Minimum Control Measure #6, Pollution Prevention/Good Housekeeping for Municipal Operations. Nutrient management plans must be tailored to specific sites, and address the timing, amount, type, and method of fertilization to provide healthy turfgrass without contributing to eutrophication, groundwater contamination, and related pollution. Fort Belvoir has prepared Nutrient Management Plans for the Fort Belvoir golf course, most residential neighborhoods, and the Missile Defense Agency, with additional plans under development for the remaining neighborhoods, National Geospatial-Intelligence Agency, and the Defense Logistics Agency. They were developed by the Fort Belvoir Urban Forester, who is state-certified to prepare nutrient management plans.

- ***The Chesapeake Bay Preservation Area Designation and Management Regulations 9VAC25-830-10 and the Chesapeake Bay Preservation Act (Virginia Code §§ 62.1-44.15:67 through 62.1-44.15:79)***
  These regulations state that all counties, cities and towns in Tidewater Virginia shall comply with regulations therein regarding RPAs. Fort Belvoir does abide as required by maintaining 100 foot RPA areas on post around perennial streams and adjacent wetlands. Development in these

areas is avoided and minimized. When impacts occur, an additional review is conducted to determine the extent of impact, as well as mitigation for the RPA infringement. Mitigation for RPA impacts typically includes the replanting of trees and or shrubs at a predetermined ratio or the enhancement of a degraded RPA elsewhere on post. RPAs are typically addressed during either the wetland permitting process or during Coastal Zone Management Act (CZMA) consistency determination.

6.1.3 Department of Defense Vegetation Policy

- ***Natural Resources Conservation Program (DoDI 4715.03)***
  DoD's natural resources management policy instruction requires installations to follow an ecosystem-based approach to land management using adaptive management of natural resources, to inventory and protect important biological resources, and to promote biodiversity, while being able to provide continued access to installation air, water and land for realistic military training and testing. It addresses various aspects of land management including forestry and agricultural operations, management measures for the removal or control of exotic species, beneficial landscaping practices, and habitat restoration and rehabilitation. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education, and scientific research and study, compatible with the installation's ecosystem management goals and military mission.

Excerpts from DoDI 4715.03 Select Provision Applicable to Vegetation Management
• The principal purpose of DoD lands, water, 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 they provide. • DoD shall demonstrate stewardship of natural resources in its trust by protecting and enhancing those resources for mission support, biodiversity conservation, and maintenance of ecosystem services. (Policy) • DoD Components shall assess installation lands for forestry and agricultural outlease suitability. Any such uses shall support the military mission, be addressed in and compatible with the INRMP, and be consistent with long-term ecosystem-based management goals that place ecological sustainability objectives above revenue optimization goals. Forestry proceeds shall be distributed in accordance with section 2665 of Reference (v). (Enclosure 3, item 4a) • Agricultural and forest products shall not be given away, abandoned, carelessly destroyed, used to offset contract costs, or traded for services,

Excerpts from DoDI 4715.03
Select Provision Applicable to Vegetation Management

supplies, or products, or otherwise improperly removed. Rental payments may be applied consistent with applicable terms of agricultural leases for goods and services. (Enclosure 3, item 4a (1))

- Marketable forest products requiring removal, including those on lands designated for privatization, must be disposed of by the Military Service or the value of the forest products will be deposited into the Military Service forestry account. Marketable forest products shall not be abandoned, destroyed, or donated. Forest products may be sold for salvage when their condition or value is adversely affected by natural disaster, insect damage, or other events. Forest products include, but are limited to, standing timber/trees, downed trees, and pine straw. (Enclosure 3, item 4a (1)(a)
- Marketability must be appraised by the Military Service with input from a professional forester. Facilities proposing to remove forest products must consider the environmental consequences of removal, prepare appropriate documentation required by NEPA, and comply with appropriate and applicable Federal, State, and local environmental regulations including, but not limited to, sections 470-470x-6 of Reference (h) (also known and hereinafter referred to as the "National Historic Preservation Act of 1966, as amended (NHPA)"), National Pollutant Discharge Elimination System construction permits(s), and erosion sediment control plan(s). (Enclosure 3, item 4a (1) (b)
- Each agricultural outlease must require leasee adherence to a conservation plan and the installation Integrated Pest Management (IPM) plan that details the best management practices to sustain natural resources and protect Government interests pursuant to the lease consistent with Federal contracting guidelines and in accordance with section 2667 of Reference (v). Each agricultural outlease shall use organic methods or best management practices to limit use of pesticides whenever possible. (Enclosure 3, item 4a (1)(c)
- DoD Components shall use a watershed-based approach to manage operations, activities, and lands, to avoid or minimize impacts to wetlands, ground water, and surface waters on or adjacent to installations in accordance with the guidelines and goals established in the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, pages 62565 through 62572 of Volume 65, FR (Reference (ae)) and E.O.13508 (Reference (ah)). Enclosure 3, item 4a (2) (b)
- Environmentally and economically beneficial landscaping practices shall be used on all DoD lands consistent with the Presidential memorandum (Reference (ak)). Each installation shall, to the extent practicable, conserve and protect water resources, use locally adapted native plants, avoid using invasive species, and minimize the use of pesticides and

Excerpts from DoDI 4715.03 Select Provision Applicable to Vegetation Management
supplemental watering in accordance with Reference (ak). Enclosure 3, item 4d • All DoD Components shall manage fuel loads, provide adequate planning for wildland fire management and implement prescribed burn programs where appropriate responses to wildfire shall be conducted in a manner that preserves health, safety, and air quality; protects facilities; and facilitates the health and maintenance of natural systems. This management shall reduce the potential for wildfires, function as an ecosystem-based management tool, integrate applicable State and local permit and reporting requirements, and be consistent with DoDI 6055.06 and the current Environmental Protection Agency Memorandum (References (al) and (am). Enclosure 3, item 4e

- ***Department of Defense Pest Management Program (DoDI 4150.7)***
  This instruction includes policy language specific to pest management.

Memorandum of Understanding (MOUs) were established between DoD and the Department of Agriculture on November 8, 2006, and the Department of Agriculture and the Department of the Interior on December 13, 2013. The MOUs authorize execution of cooperative agreements for mutual conservation objectives. While the earlier MOU is more general in nature, addressing the relationship between DoD and the Department of Agriculture's Natural Resources Conservation Service, the more recent MOU specifically involves the Sentinel Landscapes Partnership to "plan and execute mutually beneficial programs, projects, activities, and strategies."

6.1.4 Department of the Army Vegetation Policy

- ***Environmental Protection and Enhancement (AR 200-1)***
  DA's natural resources management policy is contained within AR 200-1, *Environmental Protection and Enhancement*.

Excerpts from AR 200-1 Select Provisions Applicable to Vegetation
• Provide for the conservation and rehabilitation of natural resources on Army lands. 4-3a (2) • The Army's land resources management goals are to: o Integrate natural resources stewardship and compliance responsibilities with operational requirements to help achieve sustainable ranges, training areas, and other land assets. o Develop, initiate, and maintain programs for the conservation, utilization, and rehabilitation of natural resources on Army land. 4-3c (2)

Excerpts from AR 200-1
Select Provisions Applicable to Vegetation

- Provide access to training and testing ranges through sustainment of installation land resources and in compliance with natural resources laws, regulations …and Army policies. 4-3 d (1) (f)
- To the extent appropriate and applicable, provide for no net loss in the capability of the installation lands to support the military mission. Identify and address threats to mission land use and give high priority to management objectives that protect mission capabilities of installation lands. 4-3 d (1) (g)
- Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with mission and INRMP objectives. 4-3 d 4. (a)
- Manage flora and fauna consistent with accepted scientific principles and in accordance with applicable laws and regulation, and, where lands and waters are suitable, for conservation of indigenous flora and fauna. 4-3 d (4) (b)
- Manage flora and fauna consistent with Army goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. 4-3 d (4) (c)
- (7) Forest Management. Practice responsible stewardship of forested lands to support the mission 4-3d(7)
- (8) Conservation Reimbursable agricultural/grazing outleasing and forestry programs.
  - Conduct programs that are compatible with mission operations and that support conservation compliance, sustainability, and natural resources stewardship. 4-3d(8)(a)
- Prepare and implement an invasive species management component (ISMC) of the INRMP consistent with specific Federal or State initiatives. 4-3d(10)
- Installations with unimproved grounds that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool will develop and implement an integrated wildland fire management plan (IWFMP) that is compliant and integral with the INRMP, the installations' existing fire and emergency services program plan(s) and the ICRMP. 4-3d(12)(b)
- Protect real property and the health of soldier, civilians, and family members from pests through use of integrated pest management (IPM) strategies. 5-1 a
- Prepare an integrated pest management plan (IPMP) that defines pest management requirements, responsibilities, and resources needed to correct pest problems at each installation. Coordinate the IPMP with all affected parties. 5-4 a.

6.1.5 Fort Belvoir Vegetation Policy

Fort Belvoir has no overarching vegetation management policy, other than the policy specified in this INRMP. The installation does, however, have two garrison policy memorandums - *Tree Removal and Protection Policy* (Appendix C) and *Integrated Pest Management Policy* (Appendix C), and management plans, such as the *Integrated Pest Management Plan* (Appendix D), that relate to vegetation management.

- ***Fort Belvoir's Tree Removal and Protection Policy***
  This policy promotes site planning techniques and construction practices that maximize retention and protection of existing trees before considering removal. The policy requires that all proposed tree and shrub removals, as well as construction and excavation activities that may impact the growth and survival of trees be approved by DPW. It also requires that two new trees are to be planted for each tree four inches and larger in- diameter-at-breast-height (DBH) removed through construction on Fort Belvoir, except in those instances when environmentally beneficial, out-of-kind, compensatory mitigation is pursued.

- ***Fort Belvoir's Integrated Pest Management Policy***
  This policy requires planning that incorporates education, record keeping, and best management practices to prevent pests and diseases from damaging personnel and property. It also requires that all pest management operations on Fort Belvoir are carried out in accordance with the *Fort Belvoir Integrated Pest Management Plan* (Appendix D). The current *Fort Belvoir Integrated Pest Management Plan* was approved and signed by the Garrison Commander in 2016.

6.2 BASELINE VEGETATION CONDITIONS

Information on vegetation conditions at Fort Belvoir was obtained through various surveys and studies (Table 6-1). Comprehensive plant community descriptions and mapping were developed through a plant community survey of Main Post (Paciulli, Simmons and Associates, Ltd., 1998a; 1999a) and FBNA (Jacobs, 2010) and an ecological communities assessment of Fort Belvoir Main Post performed by DCR-NHP (McCoy and Fleming, 2000). A natural heritage inventory, which included the identification of rare plant species and communities, was completed in 1997 by DCR-NHP (Hobson, 1996; Hobson, 1997) for Main Post and FBNA. A floristic inventory was developed, listing the plant species on Fort Belvoir Main Post (Wells, 1999) (Appendix E). Important vegetation surveys of Fort Belvoir Main Post include the baseline invasive/exotic vegetation survey (Paciulli, Simmons and Associates, Ltd., 2000b) and the baseline grassland survey (Paciulli, Simmons and Associates, Ltd., 1996). Other important vegetation surveys of Main Post and FBNA include the Timber

Inventory (North American Resource Management, 1991), the Training Areas Forest Inventory (Beane, 2016), the Watershed Survey (Landgraf, 1999; Landgraf, 2000), and the forest pest surveys/monitoring. Additionally, installation natural resources staff maintain a variety of vegetation inventories in support of base operations and maintenance (e.g., replanting opportunities, hazardous tree inventory).

Table 6-1: Sources of Fort Belvoir Vegetation Information					
Subject/Section	***Author***	***Method***	***Coverage***	***Year***	***Product***
Plant Communities (Section 6.2.1)	Paciulli, Simmons & Associates, Ltd.	Photo interpretation and field survey	Installation-wide	1998	Community mapping, species list, and report
Plant Communities (Section 6.2.1)	Jacobs	Photo interpretation and field survey	Fort Belvoir North Area	2010	Community mapping, species list and report
Plant Species (i.e. floristic list) (Section 6.2.2)	George Washington University /Paciulli, Simmons & Associates, Ltd.	Field survey	Installation-wide, exclusive of cantonment areas and FBNA	1999	Floristic species list
Natural Heritage Inventory (including Rare Species) (Section 6.2.3)	Virginia Department of Conservation and Recreation, Division of Natural Heritage (Hobson)	Field survey	Installation-wide, exclusive of cantonment areas	1996, 1997	Species list, report, and maps

Table 6-1: Sources of Fort Belvoir Vegetation Information					
Subject/Section	***Author***	***Method***	***Coverage***	***Year***	***Product***
Ecological Communities (Section 6.2.4)	Virginia Department of Conservation and Recreation, Division of Natural Heritage (McCoy and Fleming)	Field survey	Installation-wide, exclusive of cantonment areas and FBNA	2000	Species list, map, and report; permanent monitoring plots
Timber (Section 6.2.5)	North American Resource Management, Inc.	Field survey	Installation wide, exclusive of the cantonment area and FBNA	1991	Forest inventory, report, and forest compartment maps
Timber (Section 6.2.5)	US Army Corps of Engineers, ERDC-EL (Beane)	Field survey	Southwest training area	2016	Forest inventory report, and forest compartment maps
Improved Grounds (Section 6.3.4)	Real Property Maintenance Contract	Field survey	All improved grounds maintained in accordance with contract	2000	Management units and maintenance activities

Table 6-1: Sources of Fort Belvoir Vegetation Information					
Subject/Section	***Author***	***Method***	***Coverage***	***Year***	***Product***
Invasive Exotic Vegetation (Section 6.2.6)	Paciulli, Simmons & Associates, Ltd.	Field survey	Installation-wide, exclusive of cantonment area and FBNA	2000	Species list, map, and management plan
Grasslands (Section 6.2.7)	Paciulli, Simons & Associates, Ltd.	Field survey	Installation-wide, exclusive of cantonment areas and FBNA	1996	Map and management plan
Watersheds (Section 6.2.8)	Chris Landgraf (PGI, Inc.)	Field survey	Installation-wide	1999	Maps and management plan
Forest Pests (Section 6.2.9)	In-house	Field survey	In forested areas installation-wide	Annually	Survey results, management recommendations
On-going Surveys/Inventory Updates to Urban Street Tree Inventories, Hazard Tree Inventories, Landscape Plans	In-house	Field survey and landscape plans	Site- and area-specific surveys within the developed area of the installation	Annually, and throughout the year	Record of existing conditions, planting plans, design plans, tree mitigation areas & plans

Table 6-1: Sources of Fort Belvoir Vegetation Information					
Subject/Section	***Author***	***Method***	***Coverage***	***Year***	***Product***
Small whorled pogonia (Section 8.2.1)	DCR-NHP	Field Survey	300 Area, and select areas of main post	2012	Report, mapping
Sensitive Joint-Vetch (Section 6.2.3)	DCR-NHP	Field Survey	Tidal marshes	2011-2012	Report, mapping
Small whorled pogonia (Section 8.2.1)	Various agencies and contractors	Field Surveys	Installation wide	2012-current	Reports, mapping
Baseline wetlands inventory (Section 6.2.1)	Paciulli, Simmons & Associates, Ltd.	Photointerpretation and field surveys	Main Post	1997	Report, mapping
Baseline wetlands inventory (Section 6.2.1)	Paciulli, Simmons & Associates, Ltd.	Photointerpretation and field surveys	FBNA	1999	Report, mapping

6.2.1 Plant Community Surveys

A plant community survey of Fort Belvoir Main Post and FBNA was conducted using photointerpretation and limited field survey (Paciulli, Simmons and Associates, Ltd., 1998a; 1999a). This survey described and mapped 16 broad community types, covering all of the Fort Belvoir Main Post. As indicated in Figures 6.1-6.5 and Table 6.2, these types included categories such as natural and planted pine forests, various upland and palustrine hardwood stands, tidal and non-tidal wetlands, old field grasslands, and urban land. The plant community descriptions used for this survey were developed in coordination with DCR-NHP.[1] The plant community mapping is included within the installation GIS. A narrative description of each community type is contained within Appendix F.

Table 6-2: Acreage and Distribution of Plant Community Types on Fort Belvoir

Plant Community	***Acreage***		***Distribution***
	Main Post*	***FBNA^***	
Oak/Ericad (Heath Family) Forest	1,253	83	Upland areas of gravelly ridges and dry slopes
Beech Mixed Oak Forest	1,146	6	Upland areas of gradual, well-drained ravine slopes
Tulip Poplar Mixed Hardwood Forest	987	187	Moist, fertile ravine slopes and ravine bottoms
Seep Forest	39	1	Groundwater-saturated flats and slopes
Mixed Pine Hardwood Forest	196	66	Previously disturbed areas in late succession
Virginia Pine Forests	425	105	Previously disturbed areas in mid-succession
Loblolly Pine Forest	245	7	Planted stands
White Pine Forest	6	0	Planted stands
Moderately Well-Drained Floodplain Hardwood Forest	173	4	Moderately well-drained to somewhat poorly-drained floodplain bottomland
Poorly-Drained Floodplain Hardwood Forest	422	0	Somewhat poorly-drained to very poorly-drained floodplain bottomlands and sloughs

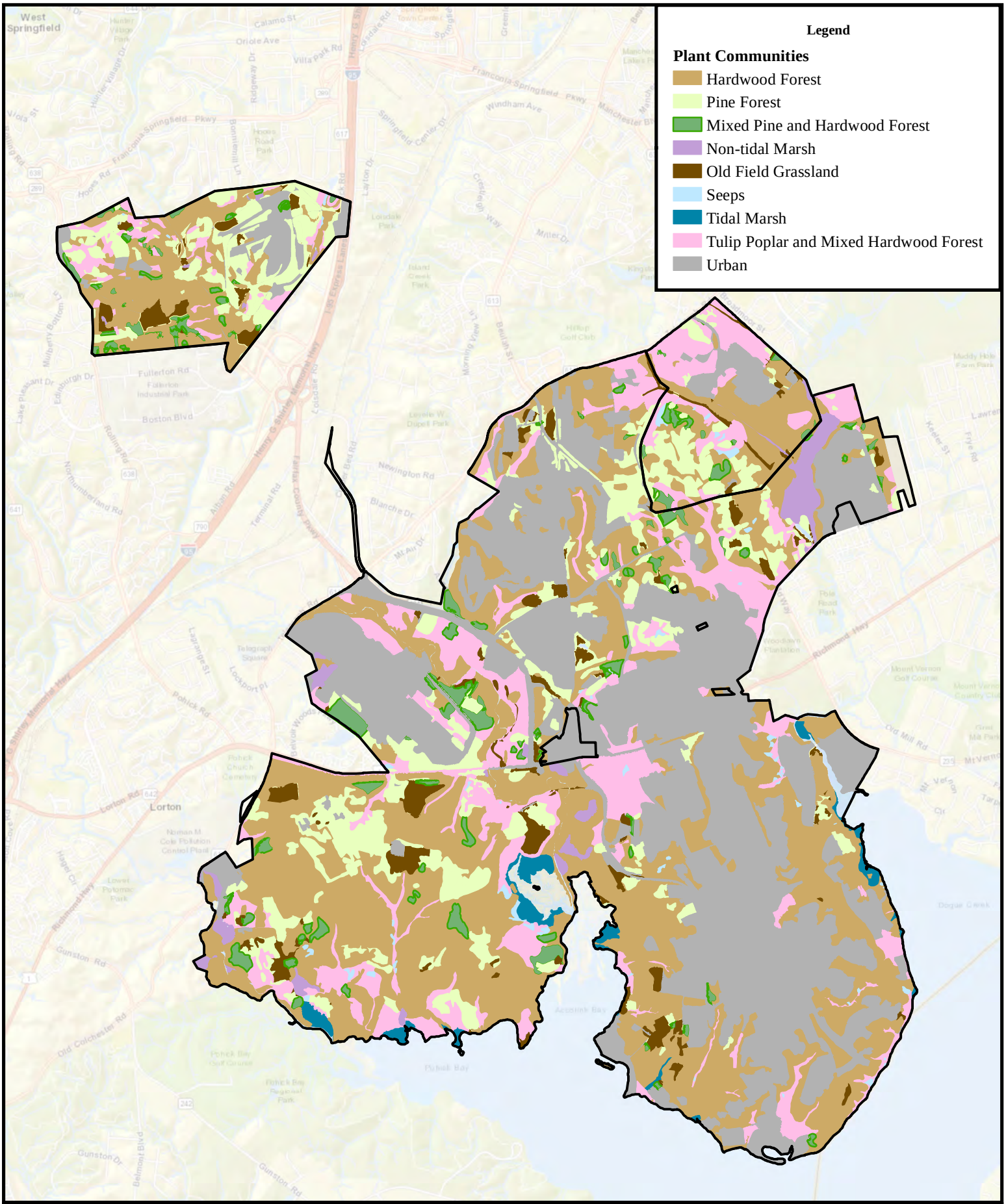
[1] Descriptions used in this survey predated development of The Nature Conservancy's National Vegetation System (used for the later ecological communities assessment; Section 6.2.4).

Table 6-2: Acreage and Distribution of Plant Community Types on Fort Belvoir			
Plant Community	***Acreage***		***Distribution***
	Main Post*	***FBNA^***	
Non-Tidal Marsh/Beaver Pond	131	0	Above tidal limits of Accotink, Pohick, and Dogue Creeks
Tidal Marsh	96	0	Shallow tidal areas of Accotink and Pohick Creeks and at the mouths of several small streams.
Freshwater Tidal Swamp Forest	45	0	Tidally influenced palustrine areas.
Tidal Scrub/Shrub Wetland	16	0	Edges of tidal swamp forests near the transition to tidal marsh.
Old Field Grassland	233	19	Previously disturbed areas in early successional stages.
Urban Land	2,809	312	All developed areas including improved grounds.

*Source: Paciulli, Simmons and Associates, Ltd., 1998a. The report did not have information on a few small areas but does include Humphreys Engineer Center; therefore, the total acreage of the plant communities differs from the total acreage of the Main Post.
^Source: Jacobs, 2010. The Accotink Creek Channel was not included in the vegetation community survey; therefore, total acreage of plant communities is less than the total acreage of FBNA.

6.2.2 Floristic Inventory

A floristic inventory of Fort Belvoir was developed by botanist Dr. Elizabeth Wells of George Washington University (1999). The inventory was developed through a detailed, multi-season field survey of representative locations of all native plant community types on post. A total of 483 plant species were identified in this inventory (Appendix E).



PLANT COMMUNITIES ON FORT BELVOIR

Unclassified // FOUO

Figure 6.1

Source: Composite image of 1997 planning level survey data and 2016 Fairfax County data derived from LIDAR, Google road maps

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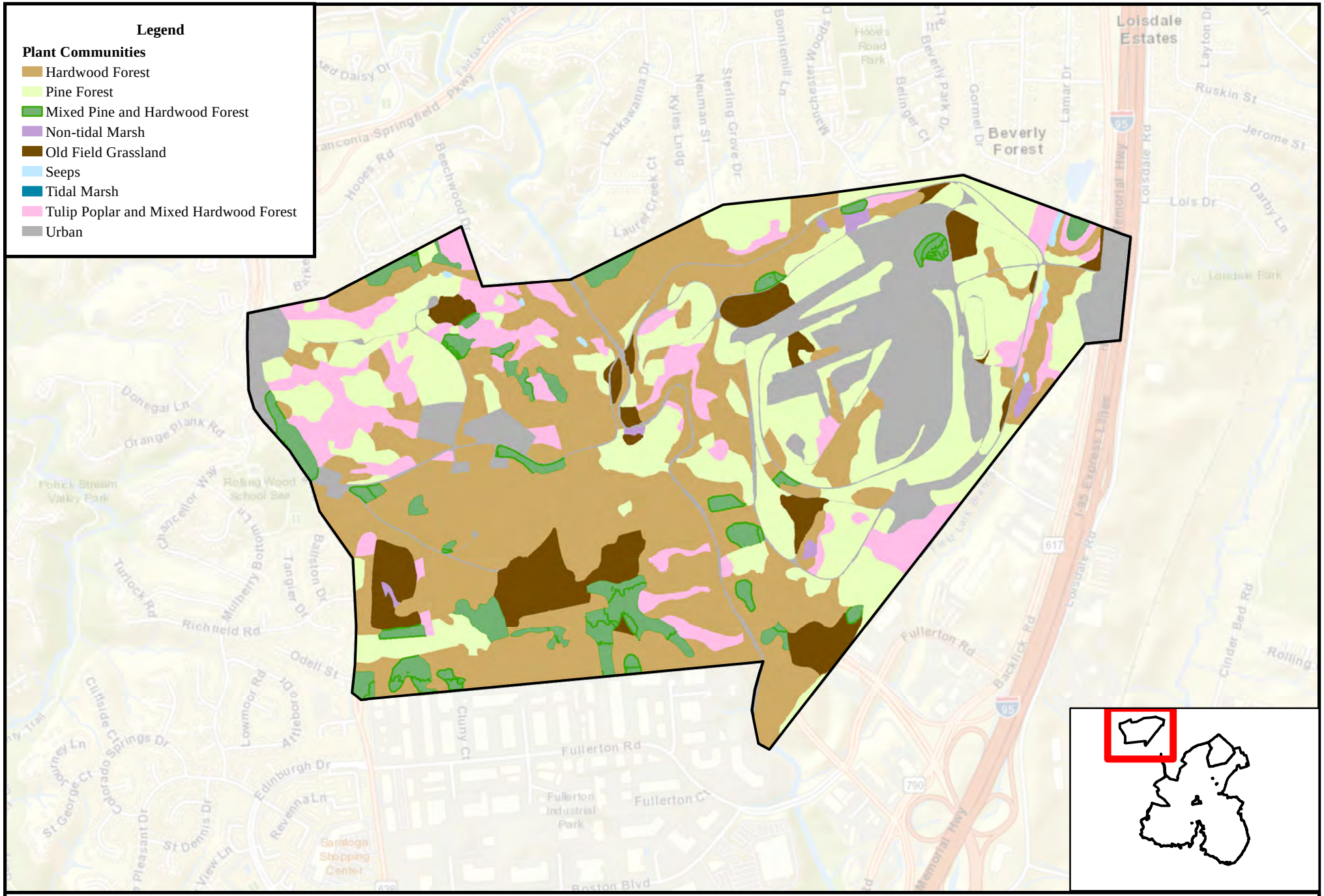

PLANT COMMUNITIES ON FORT BELVOIR, NORTH AREA

Figure 6.2

Unclassified // FOUO

Source: Composite image of 1997 planning level survey data and 2016 Fairfax County data derived from LIDAR, Google road maps

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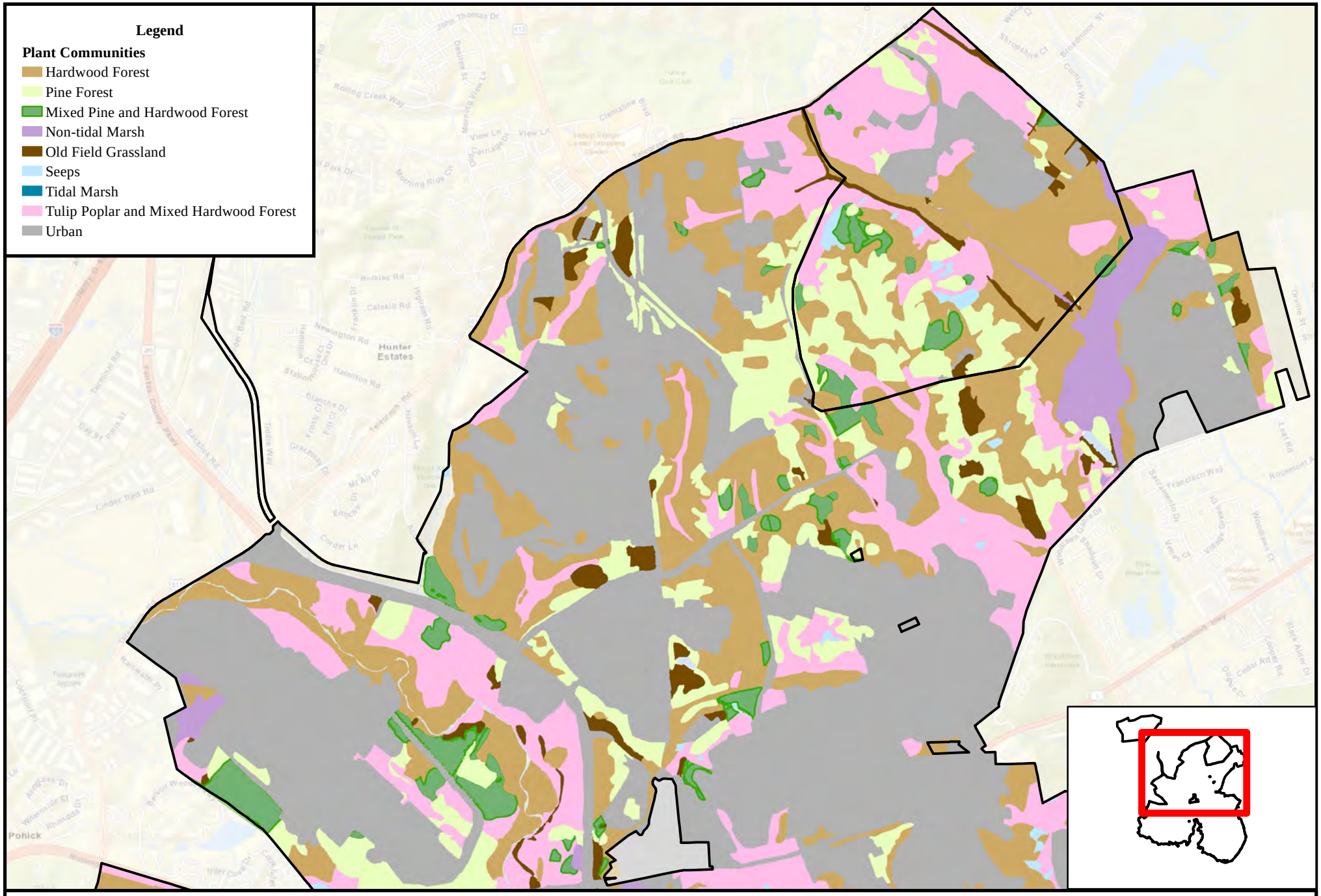

PLANT COMMUNITIES ON FORT BELVOIR, NORTH

Figure 6.3

Unclassified // FOUO

Source: Composite image of 1997 planning level survey data and 2016 Fairfax County data derived from LIDAR, Google road maps

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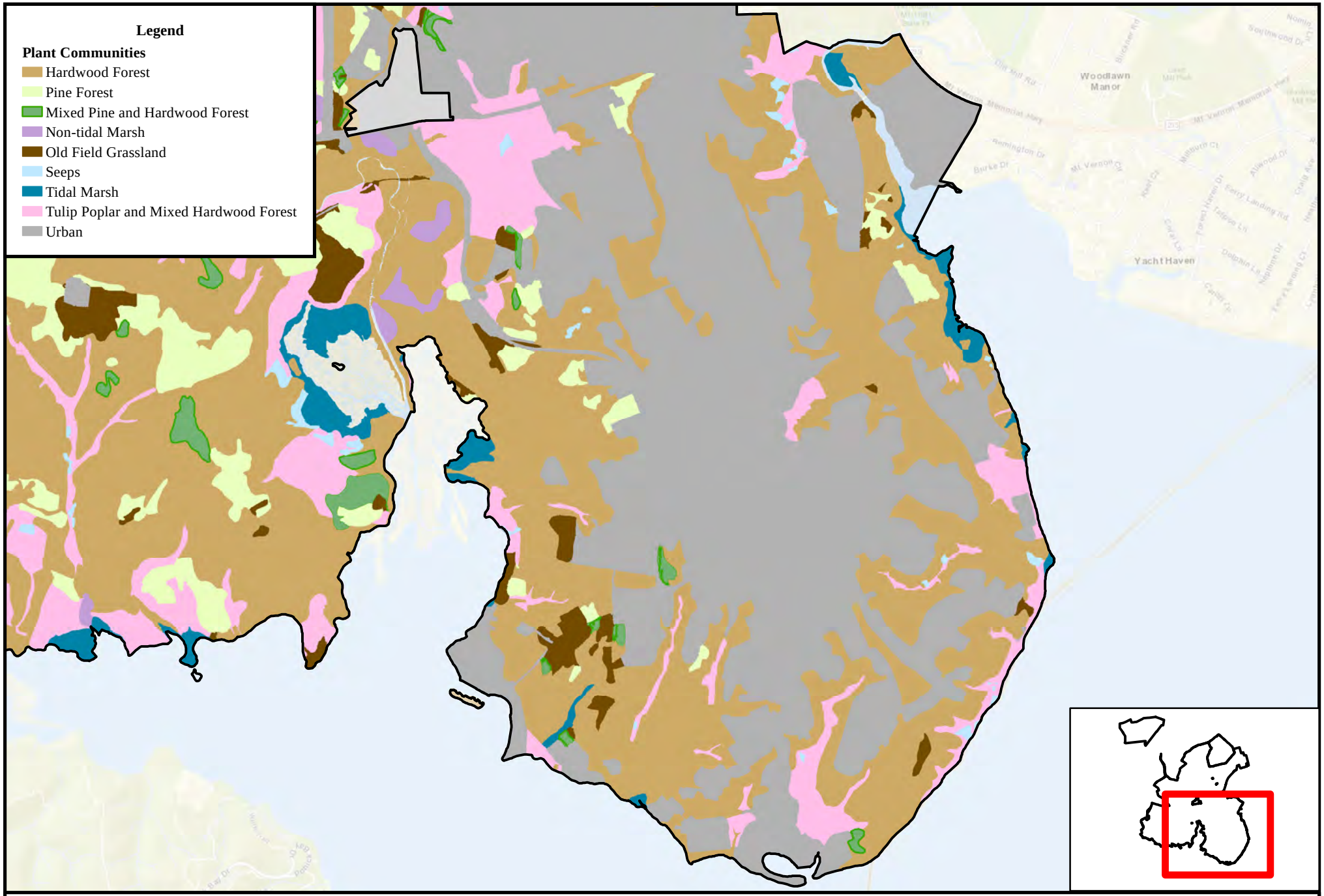

PLANT COMMUNITIES ON FORT BELVOIR, SOUTH EAST

Figure 6.4

Unclassified // FOUO

Source: Composite image of 1997 planning level survey data and 2016 Fairfax County data derived from LIDAR, Google road maps

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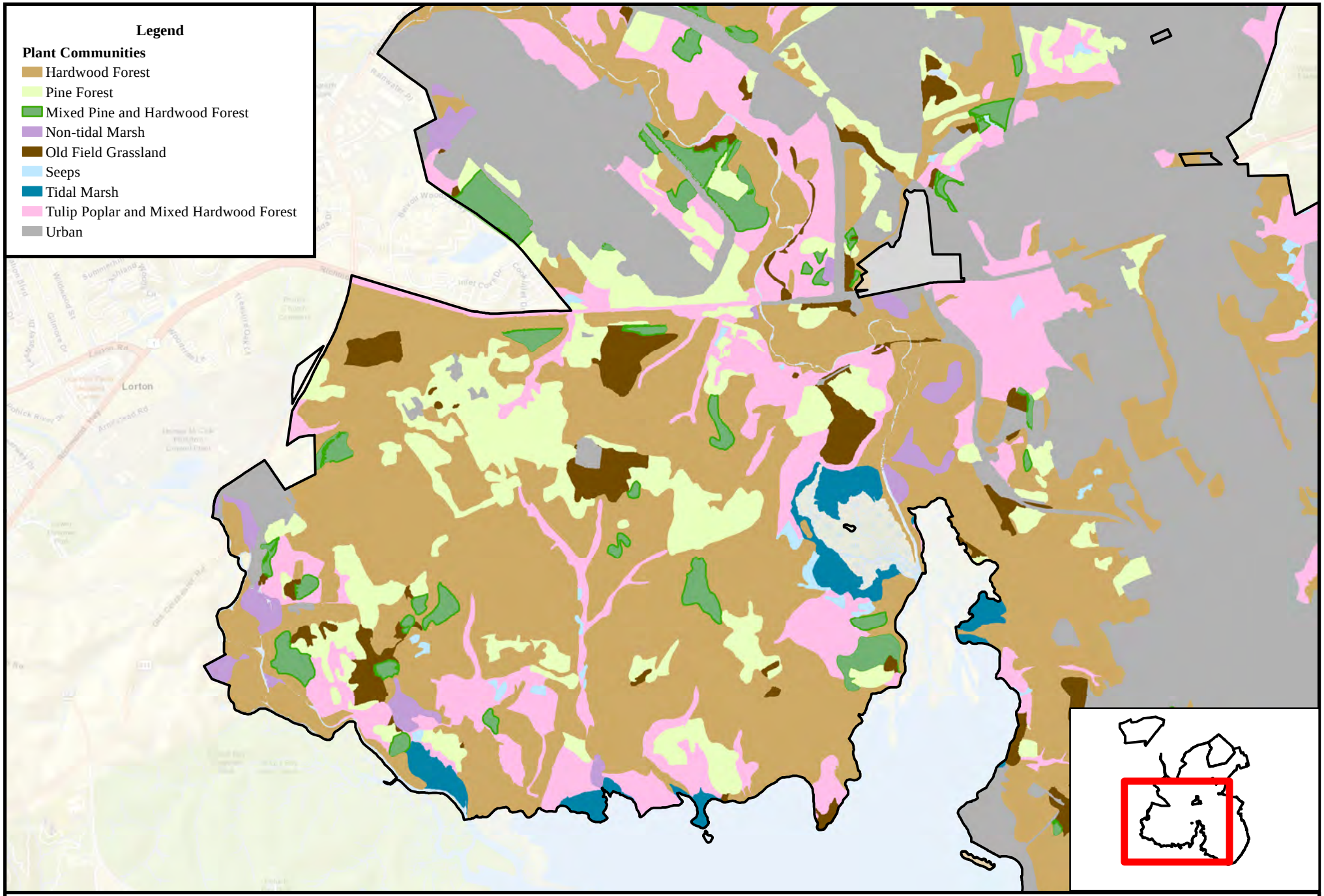

PLANT COMMUNITIES ON FORT BELVOIR, SOUTH WEST

Figure 6.5

Unclassified // FOUO

Source: Composite image of 1997 planning level survey data and 2016 Fairfax County data derived from LIDAR, Google road maps

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6.2.3 Natural Heritage Inventory

The baseline Natural Heritage Inventory of Fort Belvoir (Main Post and FBNA) was performed by DCR-NHP to address the biodiversity of the installation's natural resources in the late 1990's. This survey involved detailed, multi-season field survey over a two-year period (Hobson, 1996; Hobson, 1997). The purpose of the inventory was to systematically identify the installation's natural heritage resources (i.e., those sites supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural areas). The inventory identified four rare plant species and three watchlist plant species (Section 8.2.12).[2] The four rare plant species, velvety sedge (*Carex vestita*), vetchling (*Lathyrus palustris*), water plantain crowfoot (*Ranunculus ambigens*) and river bulrush (*Scirpus fluviatilis*) occur in the freshwater tidal marsh wetlands within the Accotink Bay Wildlife Refuge (ABWR) (Section 9.2.1.1). The locations of the three watchlist plant species, creeping spikerush (*Eleocharis smallii*), blueflag (*Iris versicolor*) and giant bur-reed (*Sparganium eurycarpum*) were not identified in the survey report, although all are wetland species. The inventory identified six locations of significant vegetation communities (all of which are wetlands): three associated with Accotink Bay wetlands within the ABWR, two within the lower parts of training areas T-7 and T-10, and one within Humphreys Engineering Center (HEC). The 1996 DCR-NHP inventory defined the boundaries of two recommended conservation areas to protect these resources. A third conservation area, located in the vicinity of training area T-17, was recommended based on the results of the 1997 DCR-NHP inventory (Figure 6.6). The recommended conservation areas are watershed-based and encompass large areas within Fort Belvoir. In 2012 and 2013, DCR-NHP re-surveyed portions of Fort Belvoir for small whorled pogonia (*Isotria medeoloides*) and sensitive joint vetch (*Aeschynomene virginica*). The survey was not able to verify presence of either species.

[2] A fourth watchlist species, American frog's bit (*Limnobium spongia*), was identified on Fort Belvoir during the DCR-NHP survey, but has since been removed from the watchlist.

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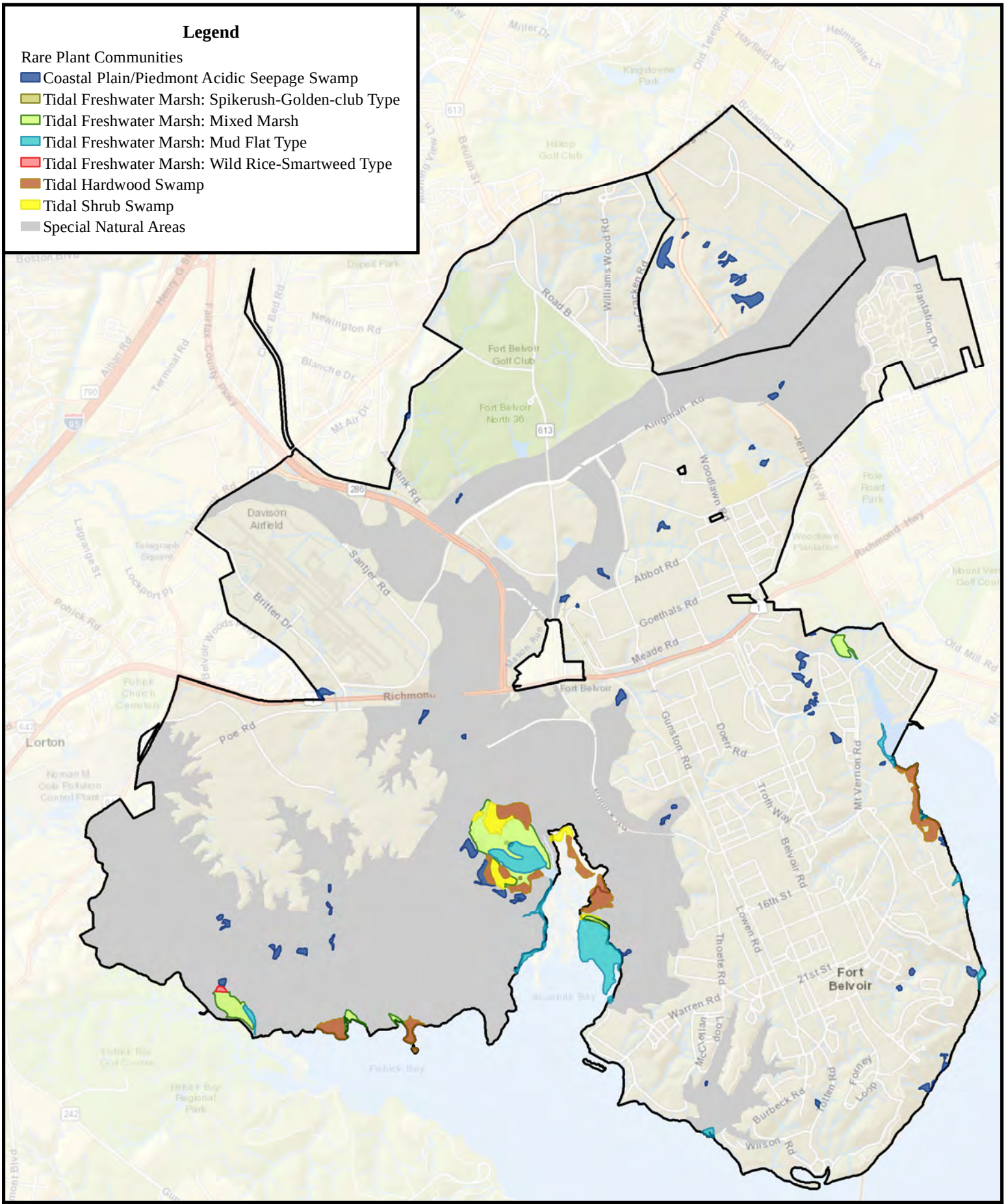

RAREPLANT COMMUNITIES ON FORT BELVOIR

Unclassified // FOUO

Figure 6.6

Source: Fort Belvoir GIS, Google road maps

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6.2.4 Ecological Communities Assessment of Main Post

The ecological communities assessment was conducted using photo interpretation of recent installation aerial photography and extensive multi-season field survey and sampling (McCoy and Fleming, 2000). The assessment was undertaken to provide a more-refined and expanded ecological analysis of the native plant communities on Fort Belvoir. The community descriptions used for this assessment were based upon The Nature Conservancy's (TNC's) National Vegetation Classification (which was not available at the time of the plant communities surveys). TNC's National Vegetation Classification is a nationwide effort for standard communities classification that addresses the vegetation cover conditions together with environmental conditions (e.g., hydrologic regime).

The ecological communities assessment identified and described 17 native plant community types on the undeveloped parts of Fort Belvoir Main Post (Table 6-3).[3] A total of 472 vascular plant taxa were recorded within the survey plots. As part of the community descriptions, DCR-NHP provided detailed ecological information including vegetation composition, soil chemistry, and physical parameters (e.g., pH, organic matter, moisture, texture, etc.). DCR-NHP assigned conservation priority rankings (i.e., rarity rankings) for each community on post. Representative plots of each ecological community type were permanently marked in the field and their locations were entered into the installation GIS, so that they may be used for future monitoring. The ecological community mapping information has been incorporated into the installation GIS.

[3] McCoy and Fleming did not address planted pine stands, or early or transitional successional types addressed by the previous plant communities survey. The difference in the number of community types between this survey and the survey by Paciulli, Simmons and Associates, Ltd., is due to the more refined definitions of ecological communities.

Table 6-3: Distribution of Ecological Community Types on Fort Belvoir		
Ecological Group	***Community Type (State Conservation Rank)***	***Distribution on Fort Belvoir***
Upland Forests	Flatwoods Mesic Forest (S4?)	Level or nearly level topography at low elevations, bordering major streams and alluvial floodplains.
	Mesic Mixed Hardwood Forest (S5)	Elevations of 3 m to 33.5 m. Lower, middle, or upper slopes. Along stream bottoms and on level areas.
	Dry-Mesic Oak-Hickory Forest (S5)	Well-drained areas around elevation of 24.8 m. Topography ranges from floodplain to ridge crest.
	Mixed-Oak / Ericad Forest (S5)	Dry acid ridgetops and upper to middle slopes. Mean elevation is 30.5 m.
	Chestnut Oak / Ericad Forest (S4)	North-facing middle and upper slopes of the Coastal Plain and Piedmont. Mean elevation of 20.6 m.
Alluvial Forests and Seeps	Alluvial Mixed Hardwood Forest: Poorly-Drained Type (S4)	Low elevation (mean = 5.9 m) forested floodplains or lowlands with poor drainage.
	Alluvial Mixed Hardwood Forest: Well-Drained Type (S5)	Alluvial floodplains at low elevation (mean = 7.9 m). Well-drained soils.
	Coastal Plain / Piedmont Acidic Seepage Swamp (S2)	Groundwater-saturated stream headwaters, small seeps and runs, stream bottoms at base of slopes. Mean elevation of 9.1 m.
Swamp Forests and Marshes	Bottomland Hardwood Swamp (S4?)	Low elevation (0 to 6.1 m) floodplains. Somewhat poorly drained to poorly drained.
	Tidal Hardwood Swamp (S3?)	Tidally-flooded, freshwater forested floodplains of Coastal Plain estuarine rivers and creeks. Poorly-drained alluvial soils.
	Tidal Shrub Swamp (S2?)	Freshwater wetlands, usually in marginal zones flooded only irregularly by tides.

Table 6-3: Distribution of Ecological Community Types on Fort Belvoir		
Ecological Group	***Community Type (State Conservation Rank)***	***Distribution on Fort Belvoir***
	Beaver Marsh: Rush Sedge Type (SM)	Low elevation (mean = 6.1 m) wetlands of Coastal Plain and Piedmont. Common in disturbed, ponded habitats.
	Beaver Marsh Arrow-arum Type (SM)	Low elevation beaver wetlands (mean = 3.1 m) of Coastal Plain and Piedmont.
	Tidal Freshwater Marsh: Mixed Type (S1)	Drier portions of the marsh complex influenced by regular tides. Poorly drained soils.
	Marsh: Mud Flat Type (S3?)	Tidal freshwater river mud flats with high water levels (1 to 3 m deep). Submerged and exposed daily.
	Tidal Freshwater Marsh: Wild Rice Smartweed Type (S3?)	Tidally influenced river systems with daily tidal flooding but beyond influence of salinity.
	Tidal Freshwater Marsh: Spikerush Golden-club Type (S1)	Tidal marshes within influence of daily flooding but beyond effects of salinity.

Source: McCoy and Fleming, 2000 [a]State Conservation Rankings:
S1 Extremely rare, generally with five or less occurrences state-wide, and/or covering <50 ha (124 acres) in aggregate; or covering a larger area but highly threatened with destruction or modification.
S2 Very rare, generally with 6 to 20 occurrences state-wide, and/or covering <250 ha (618 acres) in aggregate; or covering a larger area but threatened with destruction or modification.
S3 Rare to uncommon, generally with 21 to 100 occurrences state-wide; or with a larger number of occurrences subject to relatively high levels of threat; may be of relatively frequent occurrence in specific localities or geographic parts of the state.
S4 Common, at least in certain regions of the state, and apparently secure.
S5 Very common and demonstrably secure.
S? Unranked
S_? Rank uncertain or approximate.
SM Modified, as applied to early succession communities or beaver wetlands.

Of the Main Post's 17 native vegetation communities, DCR-NHP ranked the Coastal Plain/Piedmont acidic seepage swamp and the tidal shrub swamp as very rare, and the mixed type and spikerush golden-club type tidal freshwater marshes as extremely rare (McCoy and Fleming, 2000). These four communities are all wetland types (Section 5.2.3). DCR-NHP identified existing and potential threats to the ecological integrity of each community type on post. The most significant of these threats are (1) displacement by invasive/exotic species, and (2) stormwater-related problems (e.g., sedimentation).[4] A narrative description of each of the 17 DCR-NHP plant community types, including comments on disturbances or threats to each community is included in Appendix F.

6.2.5 Timber Inventories

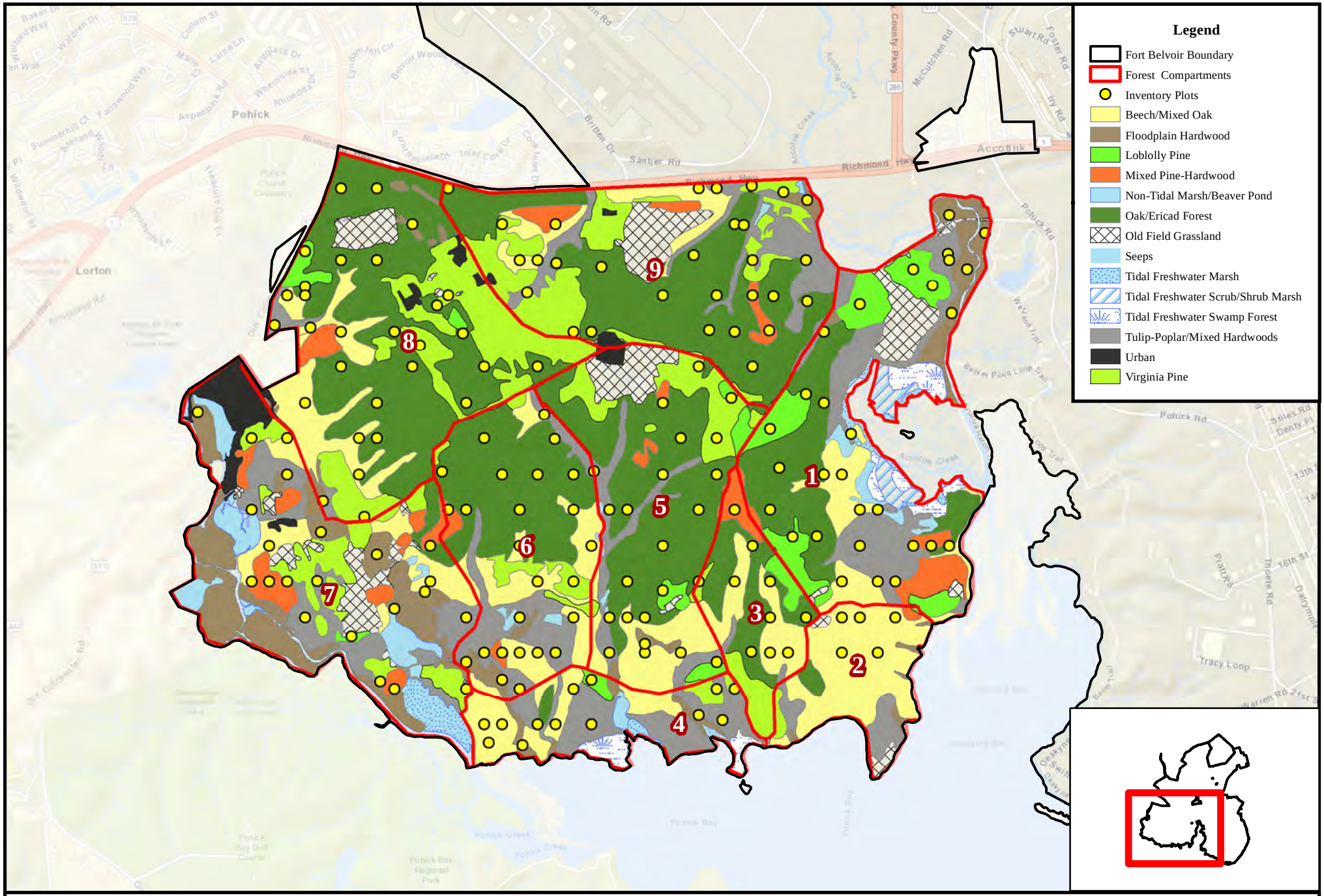
An area-specific forest inventory of the Southwest Training Area was completed in 2016, evaluating 1661.6 acres (Figure 6.7) (Beane, 2016). Prior to that, the last installation-wide timber inventory involving complete surveys was done in 1991 (North American Resource Management Inc., 1991) and updated via projection, aerial photography, and minimal ground truthing in 2001. These inventories include management recommendations, proposed harvest charts, and data summary tables.

The 2016 inventory provides a baseline of forest resources within training areas designated for both pulpwood and sawtimber resources. The strata-based valuations provided by the inventory allow flexibility in terms of evaluating impacts via future development, which would shift compartment and stand boundaries, and identifying costs associated with such development. Additionally, the inventory provides information pertaining to habitat availability, species diversity, and snag availability, which facilitates wildlife management and habitat conservation and maintenance.

6.2.6 Invasive/Exotic Vegetation Survey

The baseline survey of invasive/exotic vegetation of Fort Belvoir was developed through a multi-season field survey (Paciulli, Simmons and Associates, Ltd., 2000b). Additional surveys have been performed annually as part of the Fort Belvoir pest management program, and other installation natural resource management programs. Table 6-4 presents the invasive/exotic vegetation species identified at Fort Belvoir with significant occurrences such that they warrant consideration for control. Table 6-4 also summarizes the location and size of each occurrence, and the type of habitat in which the species typically exists.

[4] DCR-NHP did not address the threat of land development.



1 inch = 0.35 miles

0 0.1 0.2 0.4 Miles

FORT BELVOIR FOREST INVENTORY

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Figure 6.7

Source: Beane 2016, Google road maps

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Table 6-4: Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control				
Scientific Name	***Common Name***	***Size****	***Habitat***	***Location***
Ailanthus altissima	Tree-of-heaven	L	G,F	Around north and east perimeter of recycling center site/compost yard, various landfills
Ampelopsis brevipendunculata	Porcelain berry	S	F	Around the drainage culvert off of the perimeter road on the western portion of secure facility at Telegraph Road
Celastrus orbiculatus	Oriental bittersweet	L	F	Along both sides of Accotink Creek starting at the footbridge and going south along Beaver Pond Nature Trail and Accotink Creek Trail
		S-M		Scattered along roadsides throughout the post
Hedera helix	English ivy	M	F	South side of Accotink Creek near the suspension (foot) bridge
		M		In woods behind buildings on Jadwin Loop, north of the former sewage treatment facility
Hydrilla verticillata	Hydrilla	S	W	In Mulligan Pond
Lespedeza cuneata	Chinese lespedeza	S-L	G	Fields, open areas and roadsides throughout the post
Lythrum salicaria	Purple loosestrife	S	W	Along the western bank of Dogue Creek, across from Dogue Creek Marina
Microstegium vimineum	Japanese stiltgrass	L	F	Trails and old road beds
Miscanthus sinensis	Eulalia	S	G	On the north side of Johnson Road near the pier
		S		West of the intersection of Beulah Street with Woodlawn Road near old debris landfill
		L		South side of Cissna Road (FBNA) before the bridge
Murdanna kesiak	Marsh dewflower	M	W	Pohick Loop/Wetland Trail Pond
Oplismenus hirtellus ssp. *undulatifolius*	Wavyleaf basket grass	S	W	Beaver Pond

Table 6-4: Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control				
Scientific Name	***Common Name***	***Size****	***Habitat***	***Location***
Phalaris arundinacea	Reed canary grass	L	W	In and along the section of Pohick Creek that is adjacent to T-9
Phragmites australis	Common reed	M	W	Along the western bank of Dogue Creek, across from the marina, near a utility line crossing
		S		At the intersection of gravel roads, across from Dogue Creek Marina
		S		In a swale along Poe Road adjacent to the landfill
		S		In a ditch along Poe Road
		L		In a wet depression, north of the archery range along the edge of grassland field
		L		Along the nature trail, north of the archery range
		M		In a ditch along Wilson Road, just north of R&D area basin
		S		Along former Keene Road adjacent to building 2454
		L		Accotink Bay, Pohick Bay, Gunston Cove, Eastern shoreline along Potomac River, Dogue Creek
Polygonum cuspidatum	Japanese knotweed	S	G	Northwest corner of the ABWR parking lot
		M		Along the south side of Meeres Road, just west of Pole Road
		L		Subwatershed from Fairfax County Parkway to Accotink Creek
Polygonum perfoliatum	Mile-a-minute	S	W	Between Woodlawn Road and the North Golf Course along the abandoned road that is behind the golf green
		S		Along the unnamed abandoned road northwest of Kingman and Woodlawn Road intersection
		M		In W-4 just north where Jeff Todd Way and unnamed road fork
		L		Along a section of Pohick Creek that is adjacent to T-9
		M		Northeast of the intersection of training roads in W-1 and T-6C

Table 6-4: Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control				
Scientific Name	***Common Name***	***Size****	***Habitat***	***Location***
		L		Northeast of building 3065 on Poe Road, at an old well site
		M		East side of Warren Road opposite its intersection with Thayer Road
		M		West of the intersection of Beulah Street with Woodlawn Road at an old debris landfill
Pueraria lobata	Kudzu	L	F	Old home site located between the Potomac River and the Officers Club
		L		Down slope from building 2283 off of Fosters Road
		M		Surrounding portions of the coal storage area
		L		Along the access road to the former sewage treatment facility off of Jadwin Loop
Sorgum halpense	Johnson grass	M	G	Basin Trail
Wisteria sinensis	Chinese wisteria	L	G, F	In T-16, west of Jeff Todd Way just north of Pole Road where it intersects with Old Mill Road
		M		East of intersection of Beulah Street and Kingman Road in the FWC
		L		Northwest of a reforestation site, south of the pond on north golf course
		S		Along a railroad bed, west of Tracey Loop and Theote Road intersection
		M		Northern portion of T-16 on training roads inside of Kingman Gate
		S		North side of Warren Road, just north of Thayer Road
		L		From Woodlawn Road east to the western side of perimeter road
		M		North and scattered locations south of the bridge crossing Accotink Creek on Barta Road (FBNA)

Table 6-4: Invasive/Exotic Vegetation on Fort Belvoir Recommended for Control				
Scientific Name	***Common Name***	***Size****	***Habitat***	***Location***
		S		Along former Keene Road east of parking lot for building 2444

Source: Fort Belvoir Integrated Pest Management Plan, 2016; Fort Belvoir Natural Resource Staff (revised annually); Paciulli, Simmons and Associates, Ltd., 2000b

*Size Legend:

- S = Small, A single plant to an approximate 50 square foot area;
- M = Medium, Infestation is over 50 square feet but less than one-half acre;
- L = Large, Infestation is greater than one-half acre.

Habitat in this table refers to the area in which the species should be controlled on Fort Belvoir. Habitat Legend:

- G = Grassland;
- W = Wetland;
- F = Forest

6.2.7 Grassland Surveys

The baseline grassland survey was undertaken to identify grassland areas that could be managed to enhance their wildlife habitat value (Paciulli, Simmons and Associates, Ltd., 1996).[5] The inventory used photo interpretation and field surveys to identify 51 grassland areas, ranging from less than 0.5 acre to 20 acres, for a total of 190 acres of grassland on Fort Belvoir. The locations of the inventoried grasslands have been incorporated into the installation GIS. Most of the grassland areas tend to be small and scattered. The larger grassland areas occur at Davison Army Airfield (DAAF) and on the installation's closed landfills, areas which have operational limitations on manipulating land cover.

The survey generated five general types of management recommendations for grassland areas that could be manipulated including the following: (1) enhance and maintain existing grass cover (the primary management recommendation in the plan); (2) reseed with native warm season grasses; (3) use plant species that have wildlife habitat benefits; (4) install nesting structures for wildlife; and, (5) control aggressive invading weeds.

Since this baseline grassland survey was done, Fort Belvoir has been emphasizing habitat enhancement for Partners in Flight (PIF) Species of Concern bird species. As a result, installation natural resources staff have been surveying and monitoring existing grasslands and early successional habitats, as well as some later successional habitats, for potential enhancement (Section 7.3.5).

6.2.8 Watershed Vegetation Survey

Fort Belvoir completed an installation-wide watershed survey in 1999 (Landgraf, 1999). One of the parameters evaluated was the percent forest, wetland, and open area cover within watersheds and subwatersheds. The watershed survey showed significant variation in subwatershed vegetative cover; percent forested areas varied between 100 and 11, percent wetlands varied between 39 and 0.5, and percent open area varied between 65 and 0. The vegetation information from this survey, while not completely accurate for today's land cover (e.g., was gathered prior to the BRAC 2005 construction), still provides a general sense of conditions throughout the installation.

6.2.9 Forest Pest Surveys

Fort Belvoir's gypsy moth (*Lymantira dispar*) populations have remained low over the past 20 years. There has been no significant defoliation or tree mortality since 1994. Gypsy moth nucleopolyhedrovirus, as well as favorable weather

[5] Developed areas where the grass needs to be maintained, such as lawns, recreational fields, and utility rights-of-way, were excluded from this survey.

conditions for the fungus *Entomophaga maimaiga*, have held gypsy moth populations in check. No treatments have been recommended or performed over the past 20 years.

While Fort Belvoir did monitor and treat some areas for cankerworm (*Alsophila pometaria, Paleacrita vernata*) impacts to trees in the 1990s, these insects are no longer considered problematic or requiring treatment. Fort Belvoir has not experienced ecologically significant damage to vegetation from this seasonally present species, and recognizes the ecological function of cankerworms as an important food source for migrating birds.

As has occurred throughout the mid-Atlantic region in recent years, ash populations in Fort Belvoir's forest and urban areas have been decimated by the emerald ash borer (*Agrilus planipennis*). While ash species were not a major component of the forest canopy, their loss has been noteworthy throughout the installation, where ash had been frequently planted in the landscape. At this point, the most problematic aspect of this infestation has been the resultant decline in biodiversity stemming from the loss of these trees.

6.2.10 Urban Areas Surveys

Fort Belvoir maintains a variety of ongoing surveys, mostly in the developed installation areas, as part of base operations and maintenance activities. These include the following:

- Hazard tree inventory
- Pest/disease monitoring (e.g., Dutch elm disease, emerald ash borer)
- Existing landscape beds
- Tree mitigation planting sites
- Test planting locations (e.g., test plantings of disease-resistant cultivars)

These inventories are generally site- or area-specific and are continually being updated. The results of the inventories are incorporated into annual work plans for base operations grounds maintenance work, coordinated with tenant organizations who perform their own grounds work, or used for developing projects for mitigation requirements.

6.2.11 Wetland Surveys

As addressed in section 5.2.3, Fort Belvoir has done planning level surveys for wetlands, and continues to perform wetland surveys on a project-by-project basis. As surveys are performed, the information is incorporated in the post GIS data layers. Periodic updates are preferred to reflect changes in wetland acreage and composition. Typical vegetative communities found in wetlands on post

include Palustrine forested, Palustrine emergent, and aquatic. Additional information on wetlands can be found in section 5.2.2.

6.2.12 Wildlife Surveys

As addressed in Section 7.2, Fort Belvoir has completed planning level surveys for fish and wildlife resources throughout the installation, and continues to do area-specific re-surveying and monitoring. Vegetation is an important component of wildlife habitat. It also influences fish habitat through watershed conditions. Various habitat projects have taken place (Table 7.2) that address the needs of specific fish and wildlife species. Some projects are designed to create new or benefit current vegetation types at the same time.

6.3 VEGETATION MANAGEMENT

6.3.1 Management Recommendations and Requirements

Vegetation management on Fort Belvoir must balance Sikes Act requirements to conserve sensitive natural resources and provide for public access to those resources, with the requirements to support installation mission and operations. Fort Belvoir has diverse and ecologically important vegetation resources (Section 6.2) and strong public interest in accessing those resources (Sections 9 and 10.0). Fort Belvoir's installation mission and operations requires management to serve military training and testing, and to serve developed land areas (e.g., administrative, housing, community service facilities).

6.3.2 Conservation Recommendations

Baseline natural resources surveys indicate (as detailed in section 6.2) that Fort Belvoir has a large amount of undeveloped land (about 60% of the total land area) that supports significant native plant resources, and significant wildlife habitat with high conservation priority. Such resources include the following:

- Habitat for federally and state-listed threatened and endangered bat species
- Habitat for species under evaluation for federal listing
- Habitat for federal threatened (state endangered) small whorled pogonia
- Habitat for rare plant species
- Rare plant communities
- Wetlands
- Riparian forest
- Large tracts of forest, including a contiguous forested corridor through the installation

- Habitat for animal species of high conservation priority, including bald eagle (*Haliaeetus leucocephalus*), state-threatened wood turtle (*Glyptemys insculpta*), and PIF bird Species of Concern.

The survey results indicate that the installation's vegetation resources face current and future threats from such stressors as:

- Loss or fragmentation due to land development or timber harvesting
- Displacement of native species by invasive/exotic species
- Erosion/sedimentation from stormwater-related problems
- Damage/mortality by insects and disease; disturbance/destruction by wildlife (e.g., white-tailed deer (*Odocoileus virginianus)* overbrowse, beaver and woodchuck (*Marmota monax*) activity)
- Overuse by humans (e.g., recreational events in excess/inconsistent with resource conditions)

Conservation of the high-priority resources must include actions to (1) reduce the risk of threat by these stressors and (2) restore conditions where these threats have already had an impact on natural resources. Specific means for doing so will vary between projects and, therefore, will be evaluated on a case-by-case basis.

6.3.3 Military Activities

Since the departure of the Engineer School in 1988, Fort Belvoir essentially has no land-disturbing training activities. Present-day military training activities consist mainly of troop field training activities (e.g., land navigation, rescue training, expert field medical badge training) and rotary aircraft training activities (e.g., helicopter touch-and-go, helicopter transport). Consequently, most of the installation's approximately 1,838 acres of training lands are in forest cover, with limited areas of more-open vegetation cover conditions. Military mission support requirements relative to vegetation management include such requirements as:

- Maintenance of large, uninterrupted areas of natural forest and open grassland cover to support troop field training activities, such as orienteering, and to support equipment testing activities
- Maintenance of open grassland areas to support field training of rotary wing aircraft and associated activities
- Maintenance of areas to support a variety of unit-based training, such as field medical response training
- Maintenance of vegetation cover conditions (e.g., tree height, grass cover, etc.) to minimize potential hazards to aircraft operations at Davison Army Airfield (DAAF) following the protocol specified in the DAAF Wildlife Hazard

Management Plan (WHMP) (Appendix G) and Federal Aviation Administration glideslope requirements.
- Maintenance of pastures and other open areas to support The Old Guard horse stables and Caisson Platoon training activities

6.3.4 Developed Areas

The 2015 RPMP guides future development within the already-developed central core of the installation, and categorizes installation areas with ecologically significant resources (e.g., rare, threatened, endangered species habitats; wildlife migratory corridors, wetlands, riparian forests, etc.) as "least suitable for development", and part of the "Environmental Constraints Complex" on post. The tree replacement requirement of Fort Belvoir's *Tree Removal and Protection Policy* Memorandum aims to achieve a no net loss of tree cover due to development on post.

The siting, construction, and maintenance of installation facilities represents the most significant source of potential impact to native vegetation resources on Fort Belvoir. The installation has approximately 1,920 acres in developed use/considered developable, supporting approximately 145 tenant organizations, and this is projected to increase. In addition to standard requirements, such as landscape planting and maintenance; mowing; and, urban tree planting and care, there may be location/tenant-specific requirements, such as:

- Maintenance of historic landscapes within the Fort Belvoir Historic District (VDHR# 029-0209), which was designed and constructed under the Army's 1932 revised post plan, reflecting a design shift inspired by the Garden City Movement, featuring open spaces and urban planning.
- Maintenance of historic viewsheds, which involves not only the Fort Belvoir Historic District but also the Woodlawn Historic Overlay District, the Mount Air Historic Overlay District, and Pohick Church.
- Protection of archeological sites and cemeteries on and within the installation
- Avoidance of potentially hazardous plant species (e.g., berry producing shrubs) in landscaping Child Development Centers
- Rights-of-way clearances on existing utility corridors
- Force-protection clearances and set-backs

Government specifications in the Real Property Maintenance Contract prescribe standards for managing improved grounds (turf, trees, and landscape beds) on Fort Belvoir. Mowing and leaf removal specifications for improved areas reflect land use changes, current activities, and the protection and preservation of natural resources. The specifications include standards and criteria for mowing

height and frequency, turf repair and re-establishment, liming and fertilization, landscaping, and tree care.

A post-wide mowing reduction program has resulted in the removal of 70 acres from the intensive mowing and leaf removal schedule. Improved tree protection and health was a major factor in the decision to do so. Under the mowing reduction program, designated areas are either removed from mowing or are mowed only when site conditions warrant. All turf areas are reviewed annually for mowing and leaf removal modifications. In determining mowing modifications, the aesthetics, costs, area uses, environmental impacts, and equipment needs are factors that are considered.

Fort Belvoir's operational programs (e.g., grounds maintenance, stormwater management, pest management, etc.) incorporate the federal, state, and DoD and DA natural resource management policies:

- Placing specific requirements on vegetation management, including selection of appropriate plant species to avoid introduction of invasives, and to minimize water use and pesticide use requirements
- Designing planting schemes to reduce urban heat effects and support stormwater management and erosion control initiatives
- Following integrated pest management and nutrient management principles to reduce pesticide and nutrient runoff

6.3.5 Outdoor Recreation, Conservation Education, Scientific Study and Research Activities

Fort Belvoir's Outdoor Recreation Program includes such activities as hunting and fishing; hiking; guided and self-directed nature walks; and, summer day camps.

Fort Belvoir's Conservation Education Program supports on-post organizations as well as outside organizations, such as local schools and universities, scientific institutions, and other government agencies (Section 9.0). Fort Belvoir also supports scientific study and research by individuals, universities and others (e.g., The Smithsonian Institution).

These activities require the following:

- Maintenance of sizable tracts of native vegetation cover, and avoidance of fragmentation or loss of the habitat needed to support self-sustaining populations of native wildlife
- Maintenance of vegetation cover conditions within watersheds and along riparian areas, sufficient to protect fish habitat from stormwater-related impacts, and support self-sustaining native fish populations

- Maintenance of large areas of healthy native plant communities to support scientific study, viewing (including artistic pursuits such as nature photography), and to provide for natural beauty
- Conservation of rare plant communities, and habitats for federal and state endangered or threatened species, to protect those species
- Maintenance of vegetation in high-use/high-traffic recreation areas (e.g., along shorelines) to provide a visually pleasing appearance, and to protect sensitive resources (e.g., use of plantings to direct foot traffic and protect against erosion)

Fort Belvoir controls the types, locations, and magnitude of recreational activities to ensure that such uses do not adversely affect native vegetation resources. As addressed in Section 9, Fort Belvoir requires all recreational and educational activities associated with natural resources to be coordinated with DPW Environmental Division for review and approval. Group events and activities (other than participating in the installation's existing hunting and fishing programs, or individual hikes on existing trails) are evaluated on a case-by-case basis for their potential to impact natural resources. Fort Belvoir has the following restrictions in place to protect sensitive natural resources:

- No All-Terrain Vehicles (ATVs)/Off-Road Vehicles (ORVs) on unpaved roads or trails
- No bicycles on unpaved roads or trails
- Non-motorized (or electric powered) personally owned watercraft must be launched from the Dogue Creek marina or the designated launch areas along Gunston Cove and Accotink Bay in Tompkins Basin (Figure 10.2)
- Motorized (using fuel), personally-owned watercraft must be launched from the Dogue Creek marina. Waterfowl hunters under the installation hunting program may launch watercraft with electric motors only from the designated launch areas along Gunston Cove and Accotink Bay (see Figure 10.2).
- No cutting or harvesting, etc. of vegetation

6.3.6 Commercial Agricultural Production

The installation's location within an urban setting, and its considerable distance from timber mills, results in very little commercial interest in forest products. Fort Belvoir has no agricultural production areas. The installation's urban setting results in no commercial interest in agricultural outleases. Therefore, Fort Belvoir has no agricultural outlease activity.

During the late 1990s, Fort Belvoir held small-scale timber sales, mostly selective thinning of planted loblolly pine (*Pinus taeda*) stands, and firewood sales. The most recent selective thinning to improve timber stands was undertaken in 1998. Prior to that, Fort Belvoir conducted regular commercial logging of its forested

areas, and more than 4,000 acres of the installation land area were under multiple use management, including commercial forest. No areas of the installation currently are managed as commercial timber for harvest and production. The vast majority of forested areas are located within the Fort Belvoir Forest and Wildlife Corridor (FWC), refuges, training areas, stream buffers, or steeply sloped areas where commercial logging is infeasible or undesirable.

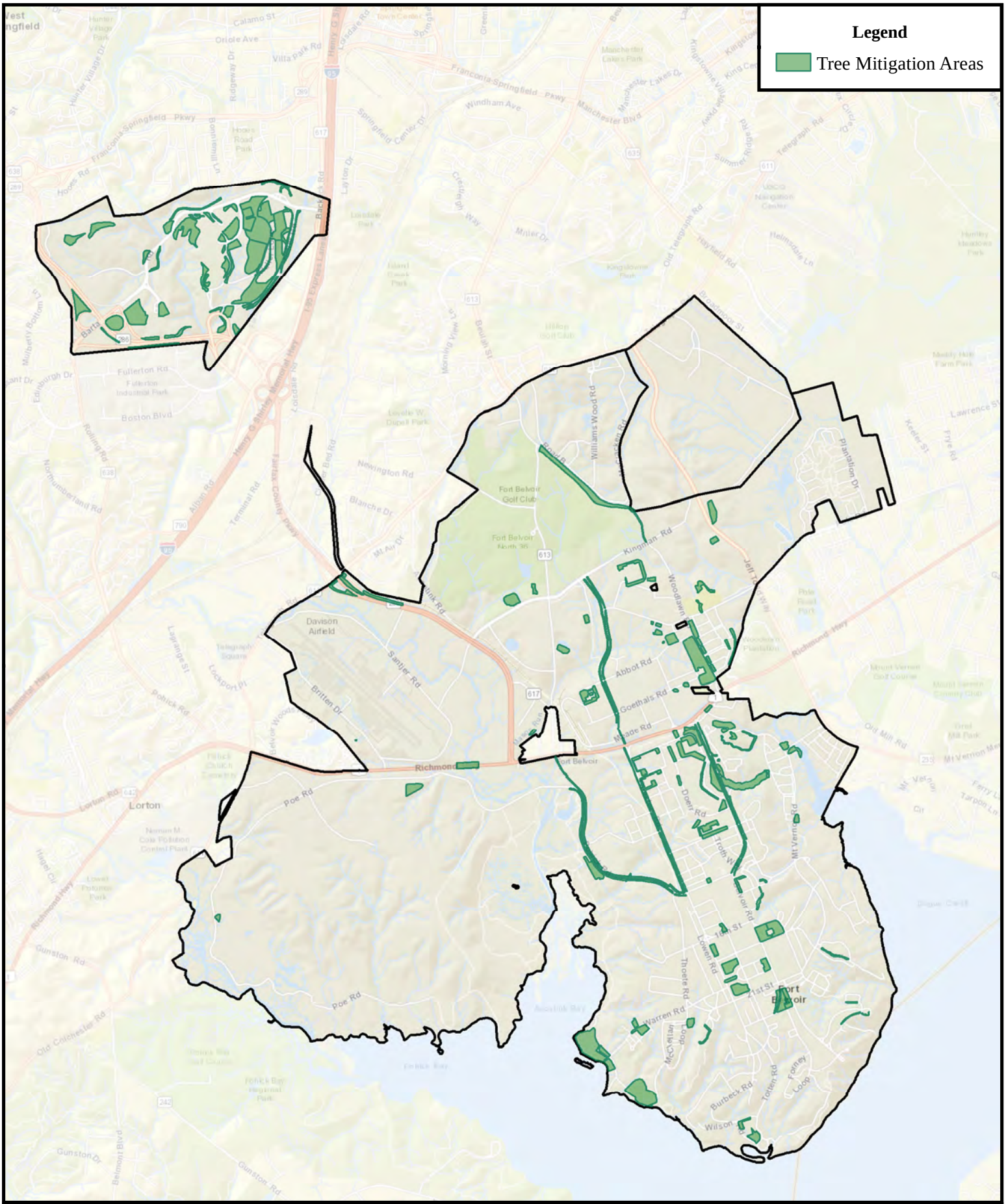
6.3.7 Vegetation Management to Date

Fort Belvoir manages its vegetation resources in accordance with the resource conservation and multiple use requirements of DoDI 4715.03 and AR 200-1. To date, Fort Belvoir's natural resources management program has focused on balancing conservation of ecologically significant vegetation resources with providing for military mission support and sustained multiple use of vegetation resources. Conservation has emphasized sustaining and enhancing forest and grassland habitats; conserving habitats of rare plant species and rare plant communities; and, conserving wetland and riparian areas. Tree mitigation areas are displayed on Figures 6.8-6.12. The Fort Belvoir *Tree Removal and Protection Policy* (Appendix C) is the primary driver of mitigation plantings on Fort Belvoir, and stream restoration regulations and requirements have driven the planting of other mitigation trees (see Table 5-10). Such plantings may be funded by MILCON or other construction project costs.

6.3.8 Conservation

Special Natural Area Designation

Fort Belvoir has designated five installation areas for conservation (as "Special Natural Areas" in accordance with DODI 4715.03: ABWR (1940 acres mostly within Southwest Training Area), Jackson Miles Abbott Wetland Refuge (191 acres in North Post), T-17 Refuge (70 acres along Gunston Cove in South Post), the Fort Belvoir Forest and Wildlife Corridor (FWC) (980 acres (exclusive of where it overlaps with the refuge areas) for forest extending from northeast to southwest across the installation, and Accotink Creek Conservation Corridor (191 acres of riparian area in FBNA). These areas encompass the majority of the installation's natural resources of high conservation priority (Section 9.0). The 2015 RPMP includes these areas in the "Environmental Constraints Complex", as areas "least suitable for development".



N
W E
S

1 inch = 0.75 miles

0 0.25 0.5 1 Miles

MITIGATION TREE PLANTING ON FORT BELVOIR

Unclassified // FOUO

Figure 6.8

Source: Fort Belvoir GIS, Google road maps,

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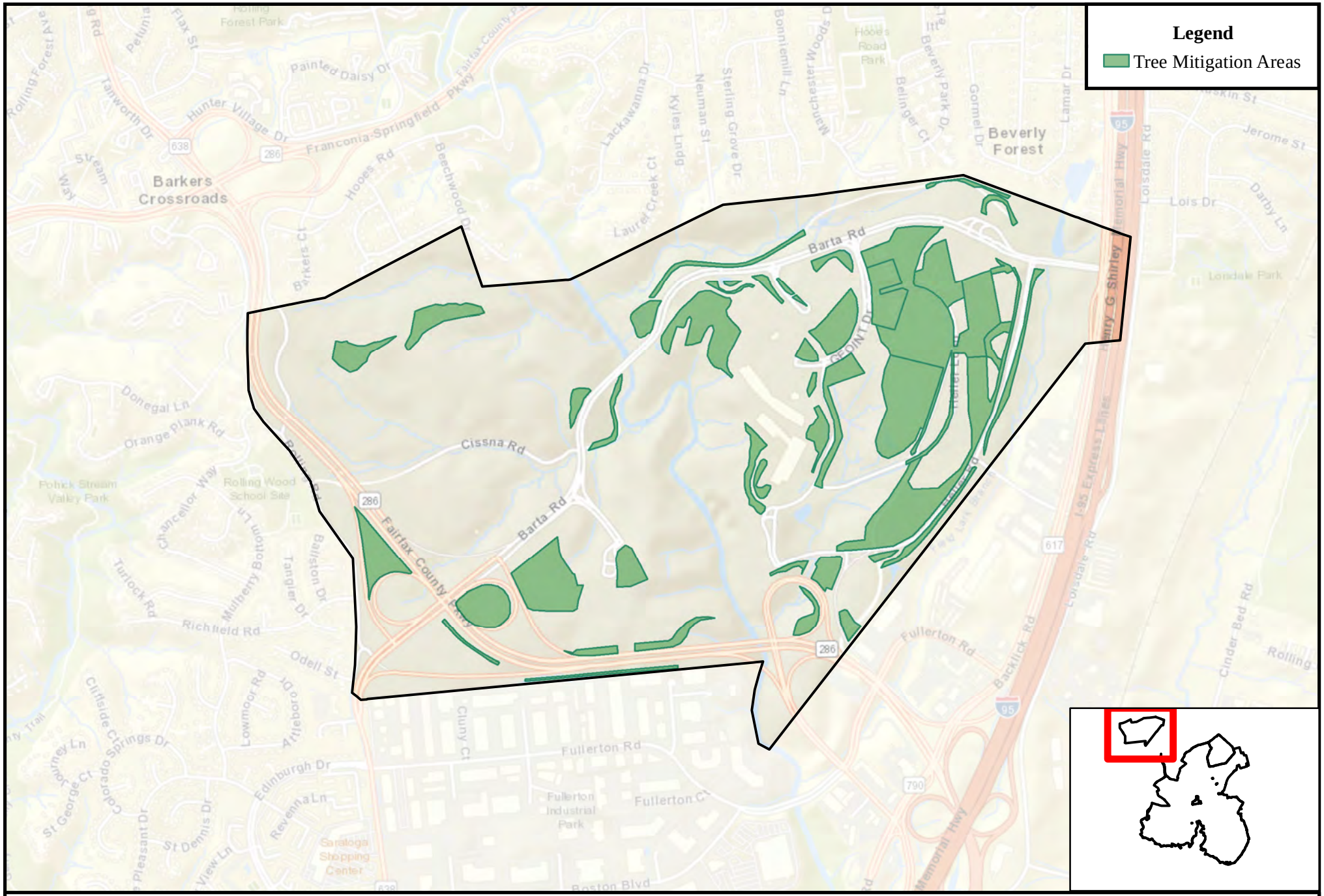

MITIGATION TREE PLANTING ON FORT BELVOIR, NORTH AREA

Figure 6.9

Unclassified // FOUO

Source: Fort Belvoir GIS, Google road maps,

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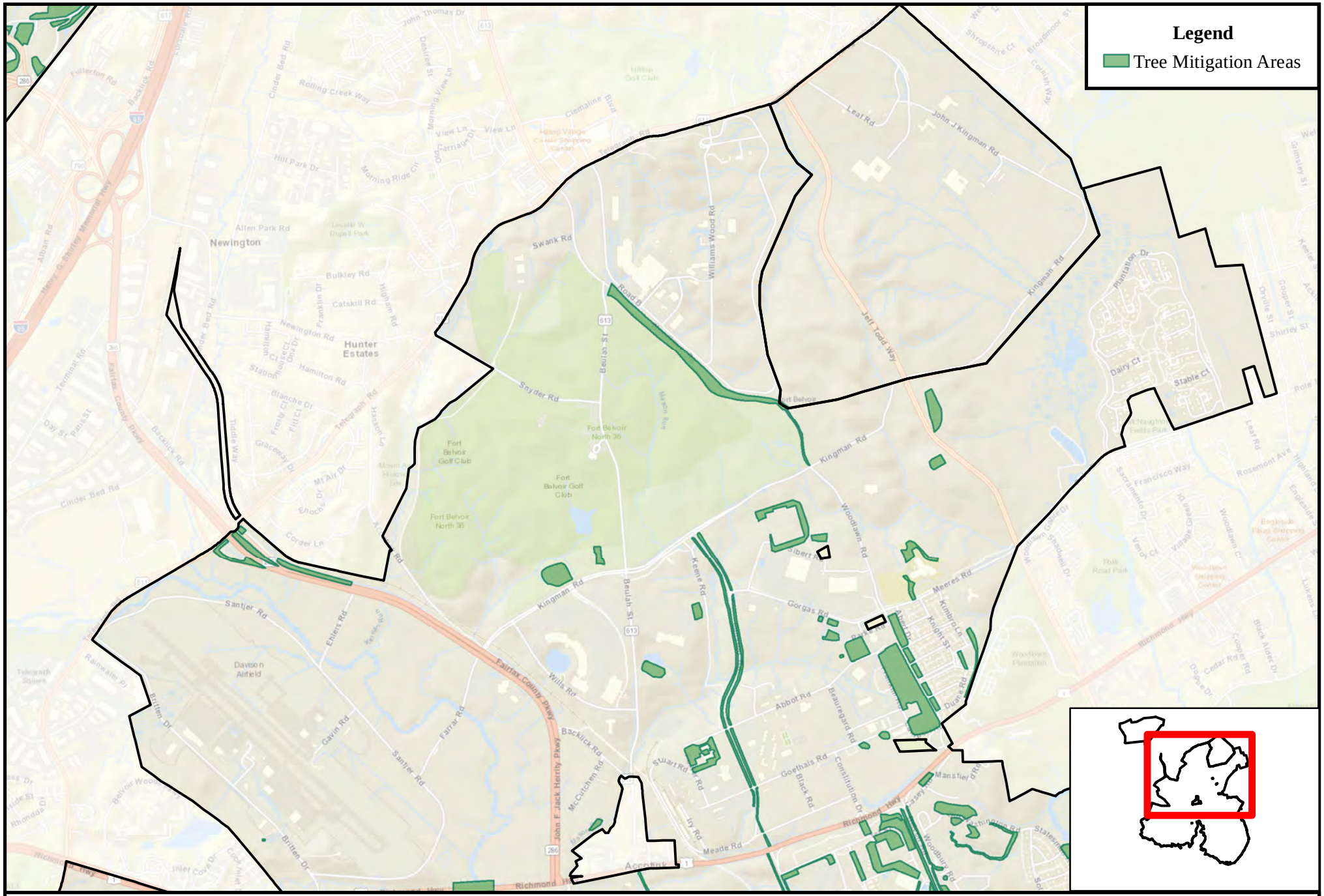

MITIGATION TREE PLANTING ON FORT BEVOIR, NORTH

Figure 6.10

N W E S

1 inch = 0.4 miles

0 0.5 Miles

Unclassified // FOUO

Source: Fort Belvoir GIS, Google road maps,

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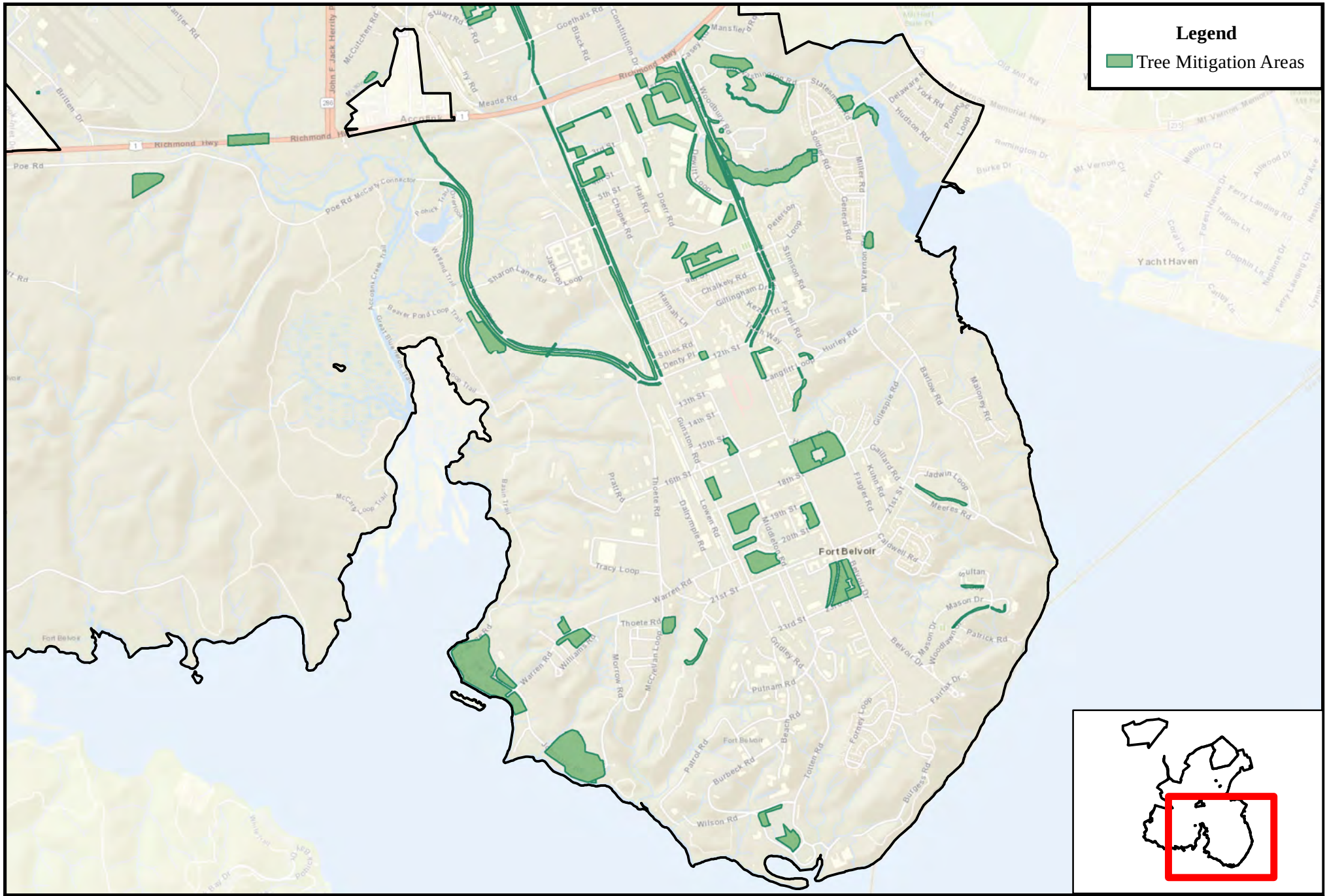

MITIGATION TREE PLANTING ON FORT BELVOIR, SOUTH EAST

Figure 6.11

Unclassified // FOUO

Source: Fort Belvoir GIS, Google road maps,

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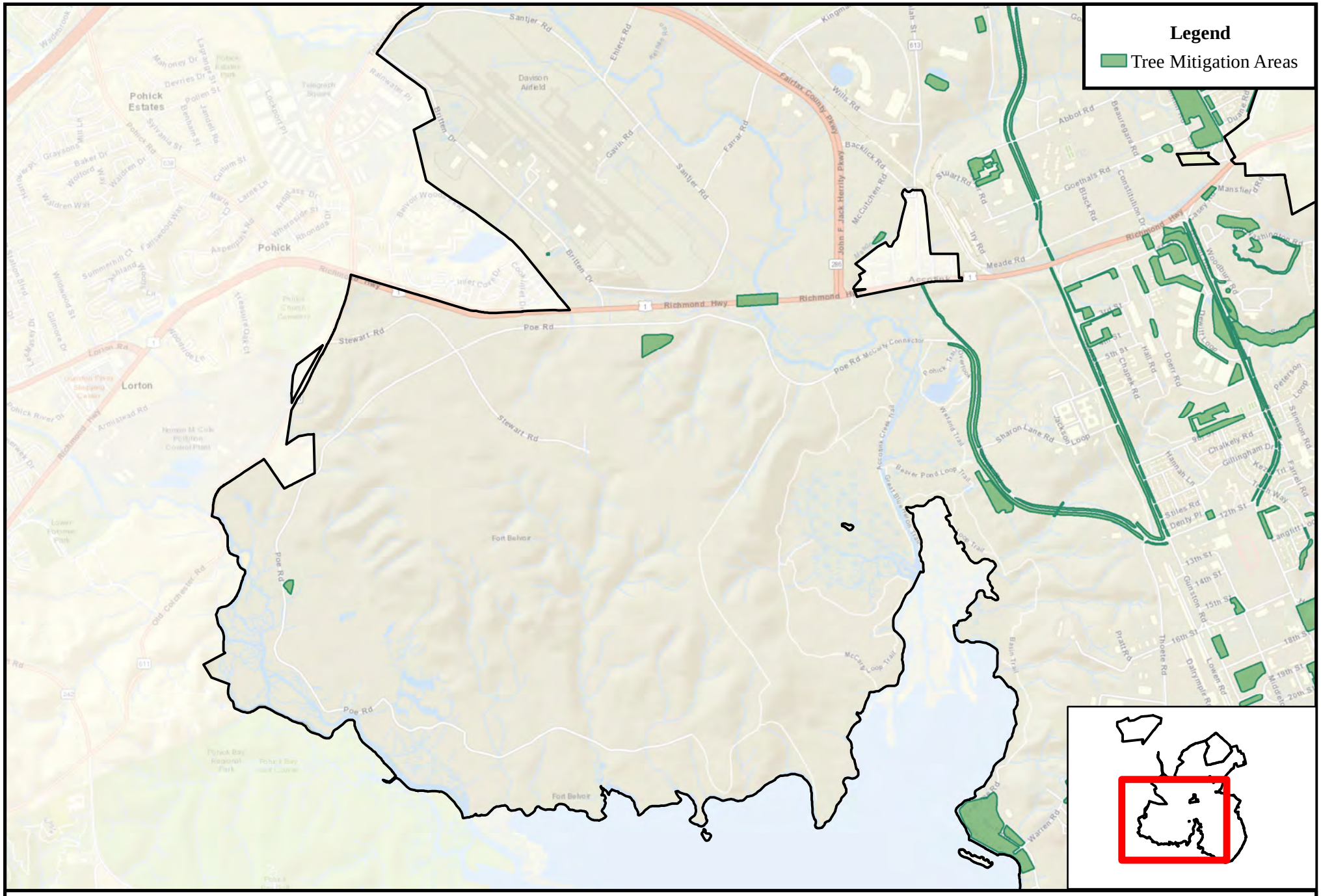

MITIGATION TREE PLANTING ON FORT BELVOIR, SOUTH WEST

Figure 6.12

1 inch = 0.4 miles

0 0.5 Miles

Unclassified // FOUO

Source: Fort Belvoir GIS, Google road maps,

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6.3.8.1 Habitat Enhancement and Vegetation Restoration

Fort Belvoir has incorporated conservation practices into standard installation operations as follows:

- Using wildlife seed mixes when replanting specific disturbed areas, where appropriate
- Alteration of mowing regimes to reduce overall mowed acreage, wherever practicable, and reducing height and intensity of mowing during periods of high heat and drought stress
- Requiring two for one replacement of all trees (at least four inches DBH) that are lost to construction
- Avoid clear cutting of utility right-of-ways by leaving small, native trees (e.g., flowering dogwood (*Cornus florida*), eastern redbud (*Cercis canadensis*) and stabilizing the soil with native seed mixes
- Requiring that mulching blades with blocked discharges be included on turf mowers
- Working with tenants who do fertilize their turf on developing and implementing nutrient management plans
- Using vertical mulching and products to inhibit crown growth while promoting root growth in order to preserve mature trees
- Selecting native plants that do not require supplemental watering outside of their establishment period

Fort Belvoir has undertaken numerous projects to re-forest areas, improve riparian vegetation, and to enhance habitat for wildlife of management priority, including the following:

- Removal of invasives and replanting of a portion of the Tompkins Basin shoreline on Gunston Cove
- Re-forestation of multiple areas within the FWC
- Selective pine thinning from too-dense planted loblolly stands, to improve wildlife habitat
- Selective cutting of areas within ABWR (e.g., W-1 and T-9) and FBNA, and vegetation planting/enhancements in T-6B, W-1 and W-3, to enhance wildlife habitat
- Tree planting within an open riparian area along Dogue Creek at the bridge
- Tree planting/re-forestation, as mitigation replacements under the Tree Removal and Protection Policy, at multiple locations throughout the installation (e.g., housing areas where construction projects had reduced the canopy, Cullum Landfill soil borrow area, along Fairfax County Parkway, Fort Belvoir Elementary School, Recreational Vehicle (RV) Travel Camp, Anderson Park)

6.3.8.2 Invasive/Exotic Species Management

Fort Belvoir controls the risk of introductions of invasive/exotic plant species by (1) maintaining recommended plant species lists and recommended seed mixtures, and (2) by reviewing all proposed planting plans.

Fort Belvoir performs regular surveillance throughout the installation to monitor known locations of invasive/exotic vegetation and to identify new outbreaks. As resources become available, Fort Belvoir has executed invasive/exotic vegetation control projects, such as:

- Cutting back kudzu (*Pueraria lobata*) along the Potomac River shoreline at the Officers Club
- Treating Japanese bamboo (*Phyllostachys* spp.) at various locations (e.g., ABWR entrance)
- Treating common reed (*Phragmites australis*) at a number of sites bordering Accotink Bay and Dogue Creek
- Removing purple loosestrife (*Lythrum salicaria)* at Tully Gate, the Youth Center, and other locations in the improved area.
- Treating Beaver Pond Trail area (ABWR) for marsh dewflower (*Murdannia keisak*) and wavyleaf basketgrass (*Oplismenus undulatifolius*) infestations
- Removing Johnson grass (*Sorghum halepense*) and Japanese stiltgrass (*Microstegium vimineum*) along trails within ABWR
- Removing Japanese honeysuckle (*Lonicera japonica*) and Amur honeysuckle (*Lonicera maackii*) along Gunston Cove shoreline at Tompkins Basin.

6.3.8.3 Problem Wildlife Management

The primary sources of wildlife impact to Fort Belvoir's vegetation resources are deer overbrowsing and beaver activities (e.g., tree gnawing and dam construction). Deer management consists primarily of population control, which is a long-term program (Section 7.3.2). Beaver management is undertaken on a case-by-case basis, and consists of installation of beaver guards (e.g., fencing around trunk of trees) to protect individual trees. Fort Belvoir uses tree shelters (i.e., tree tubes) to protect newly planted trees from damage by deer and rodents.

6.4 CONTINUING AND FUTURE VEGETATION MANAGEMENT

Fort Belvoir intends to continue the management emphasis and actions addressed in Section 6.3. Simply put, this will be to conserve and enhance native vegetation resources, while providing balance among the multiple legitimate uses of installation natural resources. Continued support of military training and

testing will take priority. Once those priorities are addressed, management emphasis will be on conservation and enhancement of vegetation resources in accordance with established DoD and DA natural resources management policies, and DoD and DA commitments to natural resource stewardship programs.

Fort Belvoir will continue to provide the public opportunities to access installation and areas for recreation and for conservation education and scientific research and study, consistent with resource conservation objectives, military mission and consistent with operations and security requirements.

6.5 VEGETATION MANAGEMENT GOALS, OBJECTIVES, AND STRATEGIES

6.5.1 Projects

Proposed activities that are considered Projects in this INRMP are activities that may potentially impact the environment and would need to be evaluated for the appropriate level of NEPA documentation. The following goals contain Projects within their objectives or strategies:

Goal 1: Continue to protect against loss of native diversity and ecosystem function of Fort Belvoir's vegetation resources.

- ***Objective***: Conserve and enhance areas of ecologically significant vegetation resources as stipulated by regulatory requirement, mitigation commitment, or that have been prioritized for conservation, such as:
  - Endangered, threatened, or rare plant species and their habitats
  - State rare plant communities
  - Wetlands
  - Riparian forests
  - Contiguous forest corridor
- ***Strategy***: Identify areas of ecologically significant vegetation resources, consistent with DoDI 4715.03 policy for designating specific areas of the installation that warrant special conservation as "Special Natural Areas" (see Section 9) if consistent with military mission. Maintain designation of the five existing Special Natural Areas as environmentally constrained to development under the RPMP and as warranting conservation considerations in other installation plans and documents. Designate new Special Natural Areas where legally obligated to do so.

Goal 2: Continue to maintain a riparian forest buffer along all installation waterways and shorelines.

- ***Objective***: Maintain consistency with the Chesapeake Bay Program Riparian Buffer Directive.

- ***Strategy***:
  1) Re-plant, or enhance, native vegetation within riparian areas.
     Examples of possible projects include the following:
     a) Reforestation of a minimum 200-foot wide riparian zone on the former petroleum, oil, and lubricant site along Gunston Cove
     b) Riparian plantings along the Tompkins Basin shoreline, consistent with the planning for a multi-purpose recreation area at that site
     c) Enhanced riparian planting along Dogue Creek in the area of the Mount Vernon Road Bridge, in association with the planned replacement of that bridge
     d) Additional planting projects will be identified and undertaken as land-use changes (e.g., as old areas are vacated and structures are removed) allow.
  2) Identify, design, and implement stream restoration projects. These projects include stabilization and restoration of riparian vegetation.
  3) Protect riparian buffer areas by directing water-based training activities to designated shoreline training areas and recreational activities to designated shoreline recreational areas.
  4) Incorporate Resources Protection Area (RPA) requirements (100-foot buffer on each side) along perennial streams as defined by the Chesapeake Bay Preservation Act and the Fort Belvoir-defined Riparian Buffer Area (35 feet to each side) on intermittent and ephemeral streams on all facility planning and site designs (Section 5.1.4).
     a) Identify the RPAs on post
     b) Incorporate RPAs, and riparian planting and stream restoration project sites in the installation GIS

Goal 3: Continue to maintain a forested corridor through the installation to provide for wildlife migration within, and through, Fort Belvoir

- ***Objective*:** Reduce forest fragmentation and restore contiguous forest cover within the FWC.
- ***Strategy*:** Prioritize siting construction outside the FWC. Prioritize the FWC for re-planting and re-forestation projects**.** Minimize clearing needed for infrastructure, as practicable. Revegetate previously disturbed areas, as practicable.

Goal 4: Continue to obtain scientific information on installation vegetation resources.

- ***Objective***: Support our knowledge of biodiversity, to identify stressors and detect changes to biodiversity, and to evaluate the effectiveness of management actions.
- ***Strategy***:
  1) Update Planning Level Surveys (PLS) relevant to vegetation management:

a) Update the plant community inventory. Complete an inventory of FBNA. The inventory will entail field survey, photointerpretation, community characterization, and GIS data layer development. The inventory update will map plant community boundaries and will inventory the locations and acreages of each plant community type in a way that will allow for a comparison among prior inventories to identify changes.
b) Update the ecological communities inventory, similar to the plant community inventory work.
c) Perform floristic surveys throughout the installation to update the Fort Belvoir plant species list. Complete a floristic inventory of FBNA, prioritizing the Accotink Creek Conservation Corridor.
d) Complete an installation-wide update of the DCR-NHP Natural Heritage Inventory. Complete the Natural Heritage Inventory for FBNA with emphasis on the Accotink Creek Conservation Corridor.
e) Update the soils PLS by reviewing the most recent Soil Survey for Fairfax County.
f) Incorporate all PLS updates into the installation GIS.

2) Perform year-round surveillance (i.e., close observation in lieu of studies or monitoring projects) of vegetation conditions throughout the installation. This could include close observation, or monitoring, in lieu of detailed field survey.
    a) Develop and implement a protocol to monitor vegetation resources to detect disruptions and/or locations where threats (e.g., problem wildlife, erosion, sedimentation) are affecting resource integrity. Address areas for potential enhancement of vegetation conditions, potential mitigation sites for tree planting/re-forestation, etc.
    b) Develop and implement a protocol to monitor conditions within the previously identified rare plant communities on post
3) Develop and implement protocols for localized and/or issue-specific vegetation surveys and studies (e.g., plant regeneration studies), as needed to support resource management, or for specific installation projects, such as new development or mission activities.
4) Coordinate with DCR-NHP and other entities involved with plant conservation regarding stewardship of vegetation resources.
5) Incorporate the location of habitat enhancement projects in the installation GIS
6) Perform year-round surveillance (i.e., close observation in lieu of studies or monitoring projects to detect changes and activities potentially impacting vegetation.
7) Perform an annual survey of a representative sample of vegetation areas to assess changes, and to assess the success of management actions.
8) Update and maintain baseline vegetation resource information in installation documents, records, databases, GIS, etc.

9) Identify opportunities for planting, reforestation, and enhancement projects.

Goal 5: Continue to control invasive/exotic species.

- ***Objective***: Consistency with the requirements of Executive Order 13112 to control threats to native plant community integrity.
- ***Strategy***: Develop and implement an annual plan to survey and treat for invasive/exotic vegetation. Include the following in the plan:
  1) Monitor known populations of invasive/exotic plant species as recommended by Paciulli, Simmons and Associates, Ltd. (2000b) and DCR-NHP (McCoy and Fleming, 2000), and as documented through recent invasive plant surveys.
  2) Perform surveillance (i.e., close observation in lieu of studies or monitoring projects of known areas of invasive/exotic vegetation, and look for new outbreaks and species.
  3) Develop and implement projects to control invasive/exotic vegetation. Priority areas for control include locations where invasive species have invaded stream restoration or wetland mitigation sites; occur near active bald eagle nests or other wildlife areas of high conservation priority; or, where they have a high potential for spread/dispersal. Examples of locations to prioritize for treatment include: marsh dewflower eradication at a stream restoration site; kudzu removal along Potomac River shoreline; *Phragmites australis* removal from shorelines and marshes; Chinese wisteria and other invasive vine removal from riparian areas; and, tree of heaven and princess tree removal from woodlot adjacent to the installation compost facility.
  4) Monitor treated areas for success of treatment and assess the need for re-treatment
  5) Develop and publish planting guidance to inform installation personnel regarding invasive/exotic species, and to reduce the risk of release on post.
     a) Devise and prepare a policy memorandum on invasive species for command approval.
     b) Maintain the Fort Belvoir Approved Plant List and the Recommended Seed Mixture List
     c) Review and revise the Fort Belvoir Installation Planning Standards in the Fort Belvoir RPMP
     d) Develop and publish informational articles, pamphlets, etc. (including articles in the Belvoir Eagle and posted to the Fort Belvoir website and social media) regarding invasive/exotic vegetation, why it is a problem, and how persons on the installation can reduce the risk of it harming sensitive natural resources on post
  6) Review all proposed planting and seeding plans, and prohibit the use of invasive/exotic species.

7) Establish/participate in regional programs and projects for invasive/exotic vegetation control.
8) Incorporate all information on known sites of invasive/exotic vegetation, as well as treatment areas, in the installation GIS.

Goal 6: Continue forest management practices to reduce risk to forest integrity.

- ***Objective***: Review installation activities for potential effect to forest conditions and make recommendations to avoid forest loss or fragmentation
- ***Strategy***: Update the forest inventory for the remainder of the forested land on post, using the same protocol as used by Beane, 2016
  1) Develop and implement a protocol for surveillance and treatment for forest pests. Determine action threshold for treatment. Address regional coordination. Continue to focus on detecting occurrences of new forest pests, such as Asian long-horned beetle (*Anoplophora glabripennis*) or beech bark disease (*Neonectria* spp.).
  2) Support the Fort Belvoir Wildland Fire Management Program.
     a) Assist the Fort Belvoir Fire Department in reviewing and updating the installation's Integrated Wildland Fire Management Plan as necessary.
     b) Maintain regular coordination with the Fort Belvoir Fire Department regarding Wildland Fire Management
     c) Provide guidance to the Fort Belvoir Fire Department regarding land restoration following any incident of wildland fire
     d) Coordinate with the Virginia Department of Forestry for information on fire indices, potentially hazardous fuel loads, and fire prevention measures.
     e) Provide technical assistance for emergency situations, such as uncontrolled fires, that threaten vegetation resources.
  3) Mitigate for trees lost to construction by the following:
     a) Identify areas on post where tree planting/re-forestation could occur
     b) Develop and implement planting/re-forestation projects
     c) Assess the success of planting/re-forestation projects, and maintain sites as necessary (e.g., tree tube straightening removal; reevaluating failed plantings in terms of using different species)
     d) Incorporate the locations of tree planting/re-forestation projects within the Mitigation datalayer of the installation GIS

Goal 7: Continue to implement watershed conservation and restoration actions

- ***Objective***: Control and correct stormwater-related threats to vegetation resources, consistent with the Chesapeake Bay Program initiatives.

- **Strategy**:
  1) Support the DPW Stormwater Management Program in identifying and executing projects to replant and restore native vegetation cover, as possible and practical, throughout installation watersheds. Projects could include the restoration and replanting of existing disturbed areas, and the identification and removal of abandoned/excess pavement to reduce impervious surfaces.
  2) Support the DPW Stormwater Management Program in identifying and executing projects to correct existing stormwater management problems that are damaging stream channels and riparian areas. Projects could include siting of new stormwater management facilities, corrections/retrofits to existing stormwater management facilities, and actions to stabilize utility crossings of streams.
  3) Support the DPW Stormwater Management Program in incorporating stormwater management actions, including BMPs, on new development
  4) Develop and implement a protocol to survey and monitor vegetation conditions to assess the effect of stormwater, and evaluate the effectiveness of existing stormwater management facilities

6.5.2 Actions

Actions are those activities that do not require ground breaking or environmentally altering activities. The following goals are considered to contain Actions in their objectives or strategies:

Goal 8: Continue to conserve and enhance the installation's natural beauty.

- ***Objective***: Integrate natural resource conservation requirements into facility construction, and operations and maintenance. Provide land cover conditions to meet military training and testing requirements. Provide land cover conditions consistent with developed land use requirements.
- ***Strategy***:
  1) Use appropriate planting and maintenance based on site conditions and use
  2) Use conservation landscaping practices that result in energy savings, preservation of historic and specimen trees, management of stormwater and non-point sources of runoff, and reduced grounds maintenance costs
  3) Strive for no net loss of urban tree cover to enhance and meet ecological, aesthetic, and conservation needs and objectives
  4) Follow integrated pest management, nutrient management and best management practices to enhance and meet ecological, aesthetic, and conservation needs and objectives while maintaining and enhancing the health and value of landscape/urban trees

5) Provide opportunities for public access for recreation and for environmental education and study, consistent with resource conservation objectives, and with military mission and operations and security requirements.

Goal 9: Continue to incorporate conservation practices into routine grounds maintenance, and to perform vegetation restoration, enhancement and modification projects to support native wildlife habitat.

- ***Objective***: Incorporate wildlife beneficial measures into routine/ongoing grounds maintenance actions. Continue to maintain and restore riparian forest buffer conditions along all installation waterways and shorelines consistent with the Chesapeake Bay Program initiatives.
- ***Strategy***:
  1) Use wildlife seed mixes recommended by VDGIF when re-planting disturbed areas, where appropriate (e.g., following utility line rights-of-way clearance). Use wildlife beneficial plantings, where appropriate, when re-planting, re-foresting disturbed areas
  2) Use a mowing/maintenance strategy (e.g., seasonal schedule) at the closed installation landfills and other installation areas that must remain in an open condition, that avoids mowing during ground nesting bird breeding seasons, and that reduces propagation of invasive vegetation, such as lespedeza (e.g., using soil amendments and strip mowing and seeding)
  3) Perform turf management at levels and intensities necessary to meet the designated use, and to support the elements of the military mission, including:
     a) Review turf mowing levels and areas annually to update specific site requirements, efficiency, and compatibility with area use and natural resources. Note sites where mowing should be reduced or eliminated and make appropriate adjustments to GIS maps and real property maintenance. Identify contract specifications. Specify that best management practices, rather than set schedules, will be followed for maintenance.
     b) For Davison Army Airfield, follow mowing and vegetation management protocols and standards specified in the DAAF WHMP.
  4) Follow environmentally and economically beneficial landscaping practices, including:
     a) Use conservation landscaping practices, and planting of native plant species for the majority of new plantings. When selecting plant species, consider water requirements, soils, and other existing site conditions that relate to plant survival and site compatibility.
     b) Identify annual requirements for landscape plantings as well as tree and shrub seedlings for site reclamation and restoration of

native habitat. This includes terminated training areas, building demonstration sites, utility rights-of-way, and other areas suitable for habitat restoration.

5) Employ practices of Integrated Pest Management (IPM) and Nutrient Management in installation grounds maintenance in order to minimize pesticide and nutrient use, and the potential for runoff of pesticides and fertilizers. These include the following:
    a) Perform an annual review and update of the Fort Belvoir Integrated Pest Management Plan (IPMP)
    b) Incorporate IPM practices and techniques into the Real Property Maintenance Contract technical specifications, and communicate the IPM requirements to facilities managers and private partners who have their own grounds maintenance contractors/ operations.
    c) Prepare a Nutrient Management Plan for each installation area that requires one. Perform an annual review of each plan.
    d) Educate and inform installation facility managers on the requirements and practices of IPM and Nutrient Management
    e) Perform regular compliance inspections and reporting for IPM and Nutrient Management, as required
    f) Identify the areas requiring Nutrient Management Plans in the installation GIS

Goal 10: Continue to manage the populations and actions of wildlife having deleterious effects on installation vegetation resources and associated wildlife habitats.

- ***Objective***: Control threats to vegetation resource integrity.
- ***Strategy***:
    1) Control the deer population through the Fort Belvoir hunting program.
    2) Monitor beaver and woodchuck activity to detect impact to vegetation resources. Establish impact thresholds that trigger control action. Develop and implement protection measures if impact thresholds have been exceeded, as recommended by DCR-NHP (Hobson, 1996; McCoy and Fleming, 2000).

Goal 11: Continue to facilitate coordination of projects involving vegetation with tenants, partners, contractors, and military units.

- ***Objective***: Assist in meeting mission requirements.
- ***Strategy***:
    1) Review and respond to military (e.g., Directorate of Plans, Training, Mobilization, and Security; Davison Army Airfield; Reserves, etc.) requirements for vegetation management (e.g., vegetation hazard control).
    2) Review and respond to Fort Belvoir Outdoor Recreation Office requests for access to/use of vegetation resources.

3) Review and respond to requests for access to vegetation resources for Conservation Education Program events, and for scientific research and study.
4) Review and respond to requests from facility managers for vegetation management.
5) Participate in the installation's review processes to incorporate vegetation conservation requirements into all phases of facilities planning, siting, construction, renovation, operation, maintenance, and demolition activities; in reviewing and supporting military training and testing activities; and, in reviewing and responding to outdoor recreation, environmental education, scientific research and study, all other types of land area access and use requests.
6) Re-assess the potential for active commercial timber management and timber sales in conjunction with tree removal necessitated by construction projects, in accordance with the requirements of DoDI 44515.03 and AR 200-1
7) Review and revise as needed the environmental protection specifications applicable to construction contracts to ensure that they include appropriate vegetation protection provisions.
8) Review and revise as needed Fort Belvoir Policy Memorandum # 28, *Environmental Policy* (Appendix C), as applicable to construction projects to ensure that they include vegetation protection. Develop recommendations to revise the Fort Belvoir installation design guide to address vegetation considerations.

Goal 12: Continue to issue installation-specific policies and guidance documents.

- ***Objective***: Provide direction and guidance for projects and activities that may impact vegetation
- ***Strategy***: Maintain the *Fort Belvoir Tree Removal and Protection Policy* Memorandum to stress preservation of trees, and replacement of unavoidable loss of trees due to construction. Maintain guidance documents, such as recommended seed mixes and recommended plants.

Goal 13: Continue an educational outreach program to highlight the importance of forest, riparian areas, native vegetation, conservation landscaping, etc.

- ***Objective:*** Increase the level of education and awareness for the on-post public
- ***Strategy:***
  1) Develop field educational materials and/or field trips similar to a living classroom that can be used by schools and other groups, as appropriate, and to educate the general public
  2) Identify and provide opportunities for specialized training in conservation and innovative planting/landscaping/grounds

maintenance techniques for garrison, partner, tenant and contractor personnel, as appropriate.
3) Participate in educational and service events pertaining to native plants, riparian forests, landscaping, grounds maintenance, etc.
4) Write and publish articles on vegetation resources.

Goal 14: Continue to manage natural resources information so it is accessible to, and can be used by, installation natural resource managers.

- ***Objective***: Develop and implement a vegetation resources database.
- ***Strategy***:
  1) Develop a system for storing and managing data.
  2) Enter electronic data.
  3) Scan and upload paper records.

Goal 15: Continue to enforce federal and state laws and regulations applicable to Fort Belvoir, as well as DoD, DA and Fort Belvoir natural resources policies.

- ***Objective***: Ensure Fort Belvoir remains in compliance with all applicable vegetation resources laws and policies.
- ***Strategy***:
  1) Perform vegetation resources compliance inspections
  2) Perform inspections in support of enforcement actions.

Goal 16: Continue to provide technical assistance in emergency situations, such as wildland fires.

- ***Objective***: Ensure emergencies are responded to while meeting regulatory requirements.
- ***Strategy***: Inspect and provide guidance.

7.0 FISH & WILDLIFE

The importance of military installations as fish and wildlife habitat has long been recognized. Military lands are largely protected from development and represent diverse habitat types containing a wealth of plant and animal life. They preserve ecologically important native habitats that can be havens for numerous, and sometimes rare and unique, plant and animal species. The Sikes Act, enacted in 1960 and amended in 1997, acknowledges the military's role in conserving fish and wildlife resources, and in providing public access to those resources consistent with the military mission.

Fort Belvoir provides four general habitat types: forested wetland, upland forest, open grassland, and early successional scrub-shrub. These four habitats are home to 43 species of mammals, 278 species of birds, 32 species of reptiles, and 27 species of amphibians. In addition, the waters of Fort Belvoir provide habitat for 65 species of fish.

Since the 1990's, fish and wildlife managers on federal, state, and private lands have converted from single species management to habitat management of ecosystems that benefit an array of species. In accordance with the Department of Defense Natural Resources Managers Handbook, *Conserving Biodiversity on Military Lands* (Leslie et al, 1996), Fort Belvoir has focused fish and wildlife conservation efforts on habitat management for all species based on the use of indicator species with conservation importance.

Identifying and monitoring indicator species is a practical method of measuring environmental conditions. An indicator species is a key organism, plant, or animal that is sensitive to particular environmental factors, so its presence, absence, or abundance in an area can provide information about ecological conditions. Indicator species are associated with specific habitat types, and management is implemented on those key habitats where these species occur. The ecological foundation for this approach assumes that the maintenance of the indicator species at desired levels concurrently means that the habitat integrity has been preserved. (*Wildlife Ecology and Management*, Second Edition, William L. Robinson and Eric G. Bolen, 1989) This method eliminates the need to monitor animals with widespread distribution or those not declining in numbers, and thus allows for efficient use of program resources.

Fort Belvoir's selection of indicator species was based upon (1) the recognized rarity of the species at the local, regional and national levels; (2) the availability of information regarding the species, its life history and the processes/forces influencing its rarity; (3) its susceptibility to, and immediacy of, threats and stressors; and (4) the potential for conservation actions to be successful. Emphasis was placed on indicator species with narrow environmental tolerances, and hence most susceptible to ecological disturbances. Using these

criteria, Fort Belvoir selected four species of birds with conservation importance to serve as "indicator species" for its fish and wildlife conservation efforts: prothonotary warbler (*Protonotaria citrea*), wood thrush (*Hylocichla mustelina*), grasshopper sparrow (*Ammodramus savannarum),* and prairie warbler (*Setophaga discolor*). Because these species are typically the most sensitive to habitat conditions, improving habitats for these species will likely benefit habitat conditions for other species as well. These indicator species may change based on adaptive management or through the development of a wildlife management plan. Fort Belvoir does not designate a specific aquatic indicator species because of the extensive variation in aquatic habitats and conditions. Current detection of aquatic species such as macroinvertebrates, fish, and mussels through surveys and monitoring are used as an indicator of habitat and water quality based upon those species tolerances of perturbations.

In addition to the four habitat indicator species, there is one–federal threatened species (northern long-eared bat (*Myotis septentrionalis*)); two state endangered species (little brown bat (*Myotis lucificus*) and tricolored bat (*Perimyotis subflavis*)); and three state threatened species (northern long-eared bat, wood turtle (*Glyptemys insculpta),* and peregrine falcon (*Falco peregrinus*)). These species share habitat requirements with the four indicator species. Management of these five listed species can be found in Section 8. Additional species that are on the USFWS National Listing Workplan (NLW) also share habitat with the four indicator species on Fort Belvoir. The NLW is a prioritized listing of species that the USFWS is currently reviewing and considering for, or plans to review and consider for, endangered or threatened status.

The four indicator species selected by Fort Belvoir are bird species identified by the Partners in Flight (PIF) program. The PIF program is an international-level conservation initiative and network of more than 150 partner organizations, to which DoD and DA are signatories. USFWS, as well as state wildlife agencies, including VDGIF through the state nongame program, are partners in this program. Designation of PIF Species of Concern is the result of a cooperative/coordinated effort among various federal, state and private organizations. The PIF Program strives to address the problems facing neotropical migratory birds through science, research, planning, and policy development, as well as land management, monitoring, and outreach. As part of the PIF Program, DoD installations are encouraged to incorporate elements of both the PIF Bird Conservation Strategy and the DoD PIF Bird Conservation Strategic Plan into their INRMPs. Such elements include identifying species and habitats most in need of conservation; establishing population and habitat conservation objectives; creating a Bird Conservation Plan to meet established objectives; implementing the plan; and monitoring progress.

There are practical reasons for selecting birds as indicator species – the large number of people observing birds and the large amount of data available

regarding them. Numerous amateur and professional birders are capable of observing, identifying, and reporting through various data collecting outlets. Christmas Bird Counts and breeding bird censuses have been carried out for many decades, are standardized, and provide excellent long-term records. The patterns of distribution and abundance indicated by these records can be used to determine habitat project needs.

The four indicator species selected for conservation priority use a variety of habitat types throughout Fort Belvoir for foraging and breeding. These species share habitat requirements with many, if not all, wildlife species on Fort Belvoir. Because of their shared habitat requirements, conservation actions for the nine species (i.e., the four indicator and five federal and state endangered or threatened species) will likely benefit the installation's other fish and wildlife species.

Table 7-1 presents the four general habitat types on Fort Belvoir, the associated indicator species, and examples of species that share each of the habitats. Ecological management of each habitat will benefit the indicator species as well as other species found in that habitat.

Habitat for all of these species are continuously susceptible to destruction, fragmentation, pollution, and threats from introduced species. This requires active management of the indicator species habitat to ensure the health of the overall ecosystem and the diversity of species on Fort Belvoir. Active management includes monitoring of all indicator species, routine surveillance (i.e., close observation) and response to changes in habitat conditions, habitat management, buffering or accommodating development using BMPs, and controlling public access to habitat areas for recreation.

Table 7-1: Habitat, Indicator Species, and Examples of Species Sharing Habitat			
Forested Wetland Habitats	**Upland Forest Habitats**	**Open Grassland Habitats**	**Early-Successional/ Scrub-Shrub Habitat**
Habitat Indicator Species			
Prothonotary warbler ***Protonotaria citrea***	**Wood thrush** ***Hylocichla mustelina***	**Grasshopper sparrow** ***Ammodramus savannarum***	**Prairie warbler** ***Setophaga discolor***
Example Species that Benefit from Managed Indicator Species Habitat			
Northern cricket frog (f, b, h) *Acris crepitans*	Northern spring peeper (f, b, h) *Pseudacris c. crucifer*	American toad (f, b, h) *Bufoa. americanus*	Northern fence lizard (f, b, h) *Sceloporus undulates hyacinthinus*
Wood turtle (f, b, h) *Glyptemys insculpta*	Northern ringneck snake (f, b, h) *Diadophis punctatus edwardsi*	Eastern hognose snake (f, b, h) *Heterodon platyrhinos*	Northern black racer (f, b, h) *Coluberc. constrictor*
Spotted turtle (f, b, h) *Clemmys guttata*	Marbled salamander (f, b, h) *Ambystoma opacum*	Meadow vole (f, b, h) *Microtus pennsylvanicus*	Least shrew (f, b, h) *Cryptotis parva*
Ribbon snake (f, b, h) *Thamnopis sauritus*	Deer mouse (f, b, h) *Peromyscus maniculatus*	Red Bat (f, b, h) *Lasiurus borealis*	American woodcock (f, b, h) *Philohela minor*
Star-nosed mole (f, b, h) *Condylura cristata*	Southern flying squirrel (f, b, h) *Glaucomys volans*	Northern bobwhite (f, b, h) *Colinus virginianis*	White-tailed deer (f, b, h) *Odocoileus virginiana*
Tricolored bat (f, b) *Perimyotis subflavus*	Wild turkey (f, b, h) *Meleagris gallopavo*	American kestrel (f, b) *Falco sparverius*	Hoary bat (f, b) *Lasiurus cinerus*
Bald eagle (f, b, h) *Haliaeetus leucocephalus*	Northern long-eared bat (f, b) *Myotis septentrionalis*	Rusty patched bumble bee (f, b, h) *Bombus affinis*	Monarch (f, b, h) *Danaus plexippus*

Note:

- These species do occur in other habitats, but are listed in their primary habitat and need these specific habitats to maintain populations. The use of the habitat area is annotated by:
  f = foraging; b = breeding; and h = hibernation or wintering habitat.
- **Bold text** indicates primary indicator species.
- Underlined text indicates federal/state threatened or endangered species or National Listing Workplan species.

7.1 FISH AND WILDLIFE POLICIES

7.1.1 Federal Fish & Wildlife Policies

- ***The Sikes Act (16 USC Section 670a, et seq.) as amended in the Sikes Act Improvement Act of 1997***
  This act directly requires conservation and management of fish and wildlife on DoD installations. The Sikes Act authorizes the Secretary of Defense to (1) carry out a program for the conservation and rehabilitation of natural resources on military installations, and (2) prepare an INRMP in cooperation with the USFWS and state fish and wildlife agencies. The Sikes Act requires the INRMP to reflect the mutual agreement of the parties [USFWS and state fish and wildlife agencies] concerning conservation, protection, and management of fish and wildlife resources. Section (a) (3) requires military installations to carry out a program, "consistent with the use of military installations …to provide for (i) the conservation and rehabilitation of natural resources on such installations; (ii) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping and non-consumptive uses; and, (iii) subject to safety requirements and military security, public access to military installations to facilitate the use."

- ***Migratory Bird Treaty Act (MBTA) (16 USC §§703-712)***
  This is a federal statute that implements four treaties with the U.S. and Canada, Mexico, Japan, and Russia on the conservation and protection of migratory birds. The MBTA states that it is illegal to pursue, hunt, take, capture, kill, or sell "migratory" birds or sell any of their parts (e.g., feathers, eggs, nests), alive or dead, as defined in 16 USC §§ 703-712. Further, the regulatory definition of "migratory bird" as applied in this context and detailed in 50 CFR §§10.13, is broad, and includes most native birds found in the United States – including species that do not migrate. The regulation prohibits the taking, selling, transporting, and importing of migratory bird species and includes any part, egg, or nest of such bird (50 CFR §§10.12 and 10.13).

- ***Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, 2001 (66 FR 3853 [January 10, 2001])***
  On July 31, 2006, DoD and the USFWS entered into a MOU to *Promote the Conservation of Migratory Birds*, in accordance with Executive Order 13186. The MOU does not address or authorize migratory bird take. Instead, it identifies activities where cooperation between DoD and the USFWS will contribute substantially to the conservation of migratory birds and their habitats. A 2014 MOU between DoD and the USFWS describes specific actions that DoD should take to advance migratory bird conservation, reasonably avoid or minimize the take of migratory birds,

and ensure DoD activities (excluding military readiness) comply with the MBTA in ways that are "consistent with imperatives of safety and security." In addition, Military Services must ensure that its operations are consistent with the MBTA and, in ways that help sustain the use of military managed lands and airspace for testing, training, and operations, should avoid or minimize the take of migratory birds and advance migratory bird conservation through its natural resources management activities.

- ***DoD Migratory Bird Readiness Rule (50 CFR Part 21)***
  Section 315 of the 2003 National Defense Authorization Act and the Migratory Bird Military Readiness Rule (50 CRF Part 21) implementing Section 315 authorize, with certain limitations, the incidental take of migratory birds during military readiness activities. Some confusion has arisen over whether the Armed Forces must give appropriate consideration to the protection of migratory birds only for military readiness activities that may result in a significant adverse effect on a population of migratory birds, or for all military readiness activities. Under the Migratory Bird Readiness Rule, installations must identify and consider ways to minimize or mitigate the take of migratory birds during all military readiness activities. Nevertheless, it is important to understand that for military readiness activities that are not expected to have a significant adverse effect on a population of migratory birds, an installation need only identify and consider ways to minimize or mitigate the take of migratory birds (typically, in its INRMP or in project-specific National Environmental Policy Act (NEPA) documents). Installations are not obligated to implement any measures that would diminish the effectiveness of the military readiness activities under consideration. On the other hand, for military readiness activities that may have a significant adverse effect at the population level, an installation must confer with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate any significant adverse effects.

- ***Bald and Golden Eagle Protection Act (16 USC 668-668d)***
  This act prohibits the pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, disturbing, purchase, or sale of bald and golden eagles. The act also prohibits the barter, transport, export, or import at any time or in any manner a bald or golden eagle, dead or alive; or any part, nest, or egg of these eagles, without a permit issued by the Secretary of the Interior.

- ***The Fish and Wildlife Coordination Act (16 USC 661 et seq.)***
- ***Fish and Wildlife Conservation Act (16 USC 2901-2911)***
- ***Lacey Act (16 USC §701) and Lacey Act Amendments of 1981 (16 USC §§3371-3378)***

- ***The Migratory Bird Hunting and Conservation Stamp Act (16 USC 718-718j)***
- ***Airborne Hunting Act (16 USC 742j-1)***
- ***Executive Order 13112 – Invasive Species, February 3, 1999***
- ***The Animal Damage Control Act (7 USC 426)***

7.1.2 State Fish & Wildlife Policies

VDGIF is the policy-making entity responsible for conserving, protecting, and replenishing the supply of game, nongame wildlife, and fish of the Commonwealth of Virginia (Virginia Administrative Code, 4 VAC15). Under the wildlife permit program (Code of Virginia §29.1-417), VDGIF must be consulted regarding capture, hold, propagation, and disposal of wildlife. Virginia law includes a number of provisions regarding the conservation and protection of wildlife. The Federal Government assimilates applicable State laws:

- ***The Wildlife and Fish Laws (Code of Virginia § 29.1)***
- ***Virginia's 2015 Wildlife Action Plan***

In accordance with the Sikes Act, Military installations use State Wildlife Management Plans to inform installation fish and wildlife management strategies.

7.1.3 Department of Defense Fish & Wildlife Policy

- ***Natural Resources Conservation Program (DoDI 4715.03)***
  DoD's natural resources management policy and instruction requires installations to follow an ecosystem-based approach to natural resources management using adaptive management strategies, to inventory and protect important biological resources, and to promote biodiversity, while being able to provide continued access to installation air, water and land for realistic military training and testing. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education, and scientific research and study, compatible with the installation's ecosystem management goals and military mission. DoD policy regarding endangered, threatened, and rare species is discussed in Section 8.1.

7.1.4 Department of the Army Fish & Wildlife Policy

- ***Environmental Protection and Enhancement (AR 200-1)***
  Army Regulation 200-1 covers environmental protection and enhancement and provides the framework for the Army Environmental Management System. AR 200-1 implements Federal, State, and local environmental laws and DoD policies for preserving, protecting, conserving, and restoring the quality of the environment. Excerpts from AR 200-1 are as follows:

Excerpts from AR 200-1 Applicable to Fish and Wildlife Resources
Garrison commanders • Ensure that Base Support activities support military training and readiness operations, enhance mission accomplishment, and are conducted in a manner conducive to environmental stewardship. • Comply with applicable Federal, State, and local environmental laws, regulations, internal directives and goals. • Ensure that the installation Master Plan incorporates environmental considerations. • Maintain an efficient and well-trained environmental staff. • Approve INRMP's Land Resources • Land resources are the ranges, cantonment areas, and associated natural resources (to include soils and the biota they support). • Provide for the conservation and rehabilitation of natural resources on Army lands. • Implement the INRMP by (a) actively requesting, receiving, and using funds for priority projects and activities, (b) ensure that sufficient number of professionally trained natural resource management personnel are available to perform the tasks required by the INRMP. • Prepare INRMP that includes components addressing specific natural resources. • Review the INRMP on a regular basis, but not less than every 5 years and update as appropriate. • Assure NEPA requirements are satisfied when preparing the INRMP. • Integrate the INRMP with installation Master Plan and other appropriate plans to ensure consistency. • Conduct Planning Level Surveys (PLS) to include but not limited to topography, wetlands, surface waters, soils, flora, vegetation communities, threatened and endangered species and fauna. • Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with the mission and INRMP objectives. • Manage flora and fauna consistent with accepted scientific principles and in accordance with (IAW) applicable laws and regulations, and,

Excerpts from AR 200-1 Applicable to Fish and Wildlife Resources
where lands and waters are suitable, for conservation of indigenous flora and fauna. • Manage habitat to conserve and enhance existing flora and fauna consistent with the Army goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. • Integrate endangered species management and installation planning functions to ensure compliance. • Conduct biological assessments for activities that may have an effect on listed species or critical habitat where they are present or may be present in the action area. • Use formal and informal consultation with the USFWS and NOAA-Fisheries regarding endangered species when applicable. • Manage species at risk and habitats to prevent listing that could affect military readiness. • Collect fees for hunting, fishing, and trapping and deposit into the Army Fish and Wildlife Conservation Fund (21X5095). • Provide for controlled recreational access where feasible at Army installations containing land and water areas suitable for recreational use. • Prepare and implement an invasive species management component of the INRMP. • Obtain appropriate authorization (take permit) from the USFWS before intentionally and directly taking any migratory bird species and establish procedures to avoid the unintentional take of migratory birds, including nests and eggs.

7.1.5 Fort Belvoir Fish & Wildlife Policy

Fort Belvoir has no over-arching fish and wildlife management policy other than the policy specified in this INRMP. The installation has several policy documents: *Fort Belvoir Conservation of Migratory Birds Policy Memorandum*; *Watercraft Recreation, Hunting and Fishing Policy Memorandum*; *Animal Control Regulation; and Pet Control on Post Policy* (Appendix C).

- ***Fort Belvoir's Conservation of Migratory Birds Policy Memorandum*** This policy memorandum provides guidance to conserve (avoid, minimize, and manage) migratory bird populations as long as it does not impact the military mission. Guidance is provided during all proposed activities to include but not limited to tree removals, chimney maintenance, demolition, and semi-improved mowing that may impact migratory birds during the nesting season.

- ***Fort Belvoir's Regulation 40-905, Animal Control***
  This regulation addresses the release of domesticated wildlife on installation property. The policy prohibits the release of domestic animals on post and establishes guidelines for capturing and removing feral animals. The regulation applies to all persons residing on, employed by, serving on, or visiting Fort Belvoir. It enables Fort Belvoir to enforce the policies established within the regulation.

- ***Fort Belvoir's Pet Control on Post Memorandum***
  This memorandum aims to maintain a safe and healthy living environment by making pet owners responsible for their pet's actions while on post. The regulation states that any pet: (1) not registered with the Fort Belvoir Veterinary Treatment Facility, (2) involved with an act of aggression, or (3) found unleashed or unaccompanied by a responsible party, can be ordered removed from the installation boundaries. Owners are accountable for their pet at all times.

7.2 BASELINE FISH & WILDLIFE CONDITIONS

Fort Belvoir has conducted a number of wildlife surveys for inventory and monitoring purposes (Table 7-2). As of 2017, comprehensive installation-wide inventories of all fish and wildlife, except for invertebrates, have been completed. Various additional wildlife survey efforts have been done or are underway. These are discussed below grouped by wildlife type. Surveys for federal and state endangered and threatened species (i.e., northern long-eared bat, wood turtle, and peregrine falcon) are addressed in Section 8.0. Surveys for aquatic resources are presented in Section 5.2.2.

Table 7-2: Sources of Fort Belvoir Wildlife Information					
Subject	**Author**	**Method**	**Coverage**	**Year**	**Product**
Rare species	Virginia Department of Conservation and Recreation DCR-NHP, Division of Natural Heritage	Field survey	Installation-wide exclusive of cantonment areas	1994-1995; 1996, 2003, 2013	Species lists, report, and maps
Wildlife Use of Underpass Structures in FWC	George Mason University	Field survey	3 locations in corridor	Year-round 1995-1998	Movement counts by species, report
Wildlife Use of Underpass Structures	ERDC	Field Survey and trail cameras	All designated wildlife crossing structures	2015-2017	Movement counts by species, maps, report pending
Wildlife Use of Underpass Structures	Virginia Department of Transportation	Field Survey and trail cameras	2 locations in corridor	2006	Movement counts by species, report
Wildlife Use of Underpass Structures	In-house	Field Survey and trail cameras	1 location (Gunston Rd) in corridor	2005, 2010	Movement counts by species, summary
Shellfish and Submerged Aquatic Vegetation Survey	SES Construction and Fuel Services, LLC	Field Survey	Pohick Bay, Accotink Bay, Gunston Cove, Dogue Creek	2015-2016	Species list, maps, report
Small Mammals	George Mason University	Field survey	Select locations	1988, 1994	Species lists, reports
Deer Census	In-house, contractors, and volunteers	Spotlight survey	Installation-wide route	1988-2005, 2008-present	Installation population estimate, population trends
Deer Population Characteristics	In-house, contractors, and volunteers	Measurements	All harvested deer	1995-present	Total harvest, age, sex ratio, weight data
Deer Health Check	Virginia Department of	Necropsy	Select sample	1987, 1999	Report

Table 7-2: Sources of Fort Belvoir Wildlife Information					
Subject	**Author**	**Method**	**Coverage**	**Year**	**Product**
	Game and Inland Fisheries, in-house, and Vista Technologies				
Bald Eagle	In-house	Visual	Installation wide	Annually	In-house report
Year-Round Land Bird Counts	Waterways Experiment Station (WES) and in-house (WES is now known as ERDC)	Point count, incidental	Installation-wide, excluding cantonment areas	Annual, one week each season 1998-current	Bird counts by species and report
Shorebirds	In-house	Point count	One location on Accotink Bay	Weekly July 15-October 15; March 15-May 15 1998 – 2006	Bird counts by species, report
Waterfowl	In-house and Vista Technologies, Inc.	Point count	Shorelines/tidal marsh areas	Irregular October-April 1997-2006	Bird counts by species, report
Neotropical Migratory Bird	Institute for Bird Populations	Monitoring Avian Productivity and Survivorship (MAPS) program protocol	Two sites in Training Area 16/HEC	Annually, May-June 1995-2002	Population data, report
Christmas Bird Count	Audubon Society and in-house	Audubon Society protocol	Installation-wide	Annually (December or January), 1911-present	Bird counts by species, report
Northern Virginia Bird Survey	Audubon Society and in-house	Audubon Society protocol	Installation-wide exclusive of cantonment area	Annual (June) have data from 1995-present	Bird counts by species, report

Table 7-2: Sources of Fort Belvoir Wildlife Information					
Subject	**Author**	**Method**	**Coverage**	**Year**	**Product**
Reptiles and Amphibians	George Mason University	Field survey	Corridor area	1987, 1994	Species lists and reports
Reptiles and Amphibians	In-house	Field survey	Corridor area	1988-1994	Counts by species
Amphibians	Dr. Joseph Mitchell	Field survey	South Post training area	1995 ,1997	Species list, report
Reptiles and Amphibians Survey	Paciulli-Simmons and Associates Ltd.	Field Survey	Installation-Wide	2002, 2010-present	Species list, Maps, Report
Chimney Swift Survey	In-house and contractors	Field Survey	Select locations in cantonment area	2001-2005, 2013-present	Report
Nocturnal Breeding Bird Survey	In-house and contractors	Field Survey	Select locations	2001-2007, 2012-present	Species list, maps, report
Marsh Breeding Bird Survey	In-house and contractors	Field Survey	Select locations	2001-2007, 2012-present	Species list, maps, report
Bat Survey	In-house, contractors, WES, and DCR	Field Survey	Select locations	2001-2005, 2011-present	Species list, maps, reports
Anadromous Fish Survey	George Mason University	Field Survey	Pohick and Accotink Creeks	Late 1990s-present	Species list, maps, reports
Nest Box Monitoring (multiple species)	In-house and volunteers	Field Survey	Select locations	1990s-present	Species list, maps, reports
Amphipod	GeoConcepts Engineering, Inc.	Field Survey	Select locations	2013	Maps, report
American Shad Restoration Program	Virginia Department of Game and Inland Fisheries, USFWS, NMFC, contractors	Field Survey	Potomac River	Late 1990s-present	Not applicable – no report provided to Fort Belvoir.
Wild Turkey Survey	In-house and contractors	Track count (winter),	Select locations	2001-2005	Species count, maps, report

Table 7-2: Sources of Fort Belvoir Wildlife Information					
Subject	**Author**	**Method**	**Coverage**	**Year**	**Product**
		auditory (spring)			
Smithsonian Geolocator Birds	Smithsonian Institute	Audio calls, mist-netting, leg-banding	Southwest Training Area	2010, 2011	No report provided to Fort Belvoir.
Baseline Aquatic Inventory	EA Engineering, Science, and Technology, Inc.	Field Survey	Accotink Creek, Dogue Creek, Mason Run, UN-1, UN-2	1999, 2000	Benthic macroinvertebrates, fish species, habitat, water quality, report
Aquatic survey and habitat assessment	George Mason University	Field Survey	Accotink Creek, Pohick Creek, Dogue Creek	1995-1999	Benthic macroinvertebrates, plankton, fish, habitat, water quality, report
Fish Survey	VDGIF	Electrofishing	Mulligan Pond	1999	Unpublished, field investigation only
Aquatic Survey	George Mason University	Field Survey	Accotink Creek, Pohick Creek, Gunston Cove, Dogue Creek	1984-present	Climate, water quality, plankton, fish, benthic organisms, report
Fish Survey	Ernst et al.	Field Survey	Accotink Creek, Pohick Creek, Dogue Creek below Mulligan Pond, Pohick Bay shoreline, Accotink Bay, Gunston Cove, and Potomac River.	1994	Report

7.2.1 Mammals

Mammal species occupying Fort Belvoir are fairly well documented. The mammal surveys are sufficient to provide an inventory of mammal species occurring on post. None of the surveys were designed to assess population levels and trends; the results provide general information regarding the abundance and habitat usage of each species on post.

Forty-three species of mammals have been identified as occurring, or potentially occurring on Fort Belvoir (Appendix I). The resident mammal species appear to be what one would expect to occur in the mix and quality of on-post habitat types. The northern short-tailed shrew (*Blarina brevicauda*) is probably the most abundant mammal on post, occurring in a wide variety of terrestrial habitats. The Mammals of Fort Belvoir, Virginia report (Ernst et al., 1997b) identified several species of regionally rare mammals through the field surveys. Appendix I presents more-specific information on the abundance of Fort Belvoir mammals.

Fort Belvoir possesses fairly extensive areas of undisturbed mature forest. These areas provide habitat that supports a variety of small ground-dwelling mammals such as eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*) and woodland vole (*Microtus pineotrum*), as well as the arboreal squirrel (eastern gray squirrel [*Sciurus carolinensis*] and southern flying squirrel (*Glaucomys volans*). Forest areas with shade, vegetative ground cover, and woody debris provide habitat conditions for such species as striped skunk (*Mephites mephites*), which occurs in the more upland settings, and Virginia opossum (*Didelphis virginiana*), which occurs in the more lowland settings.

Significant areas of grassy old-field habitat occur on Fort Belvoir at three closed landfills, along roadway and utility corridors, and in training areas. These areas provide habitat conditions for such species as the meadow vole (*Microtus pennsylvanicus*) and eastern mole (*Scalopus aquaticus*).

At Fort Belvoir, many mid-sized terrestrial mammals, such as the eastern cottontail rabbit (*Sylvilagus floridana*), woodchuck (*Marmota monax*), and long-tailed weasel (*Mustela frenata*) inhabit the transition areas between forest and old field habitats (i.e., edge areas) where there is both grass cover and tangled underbrush. These species can also be encountered in a wide variety of other habitat types on post.

The extensive stream, marsh, and riparian habitats on post support the water-dependent mammal species, such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), river otter (*Lutra canadensis*), mink (*Mustela vison*) and star-nosed mole (*Condylura cristata*). Beaver are of management interest on Fort Belvoir not only from a problem standpoint, but because they can significantly alter habitat conditions through tree removal and dam building. Beaver

impoundments appear to be responsible for creating extensive areas of palustrine wetland along Dogue Creek and within drainages to Accotink and Pohick Creeks.

The river otter is another species of management interest. In addition to trapping for the fur trade, which has not occurred at Fort Belvoir in the past several decades, habitat loss and water pollution are the major threats to this species' survival. Although the river otter has not been sighted frequently on Fort Belvoir, there is evidence of recent increases in this species' abundance along Fort Belvoir waterways through incidental observations of tracks and scat samples.

Fort Belvoir's largest mammal, the white-tailed deer (*Odocoileus virginianus*), can be found throughout the installation, from deep woods to wetlands to housing areas, although its preferred habitats are old-field and second-growth forest. The absence of natural predators at Fort Belvoir and throughout the region had contributed to a steadily increasing regional deer population. This population increase raised significant management concerns not only regarding the detrimental effect of overpopulation on herd health, but also on wildlife habitat (i.e., habitat loss through overbrowsing). Since 1988, the population has been declining (-74%) through liberal hunting seasons and bag limits established by the VDGIF. The creation of the Fairfax County Deer Management Archery Program in 2011, as well as the use of sharpshooters in various locations in Fairfax County outside Fort Belvoir, has also contributed significantly to the decline. The County's program currently allows hunting in the following areas that border Fort Belvoir: Huntley Meadows Park, Accotink Stream Valley Park, Pohick Bay Regional Park, and the Noman M. Cole Jr. Pollution Control Plant.

Fort Belvoir has never officially documented black bears (*Ursus americanus*), however there have been unconfirmed sightings and/or misidentifications on the installation. VDGIF has confirmed sightings of black bears within a 20 mile radius (Burke, Clifton and Tyson's Corner, VA). With the expansion of the black bear into Prince William and Fairfax Counties, the potential exists for future sightings on Fort Belvoir.

The raccoon (*Procyon lotor*) is the most abundant predator on Fort Belvoir. Other predators include the striped skunk, red fox (*Vulpes vulpes*), and eastern coyote (*Canis latrans*). These species tend to hunt edge and corridor areas, and move throughout the installation along drainages. Their populations are influenced by cycles of disease such as canine distemper and rabies. These cycles, in turn, greatly influence population cycles of the smaller mammals, as well as reptiles and amphibians. The bobcat (*Lynx rufus*), which may occur on Fort Belvoir, has been reported on the Mason Neck peninsula, where tracks have been reported in installation drainages. In addition to disease and predation, the other major source of mortality among Fort Belvoir mammals is motor vehicle impact.

Since the 2001 INRMP, bat species have been monitored annually to establish baseline conditions and more recently because of the decline in some species and the change of federal and/or state status. These surveys identified the big brown bat (*Eptesicus fuscus*), a year-round resident that occupies structures; the red bat (*Lasiurus borealis*) and state endangered tricolored bat (*Perimyotis subflavus*), both year-round residents of open woodland settings, as having been the three most common species occurring on Fort Belvoir to date. The surveys have also identified the migratory silver-haired bat (*Lasionycteris noctivagans*). Other bats that have been documented on Fort Belvoir include the state endangered little brown bat (*Myotis lucifugus*) and the federal and state threatened northern long-eared bat (*Myotis septentrionalis*), which occupy structures and forage over water and in forests, respectively; the hoary bat (*Lasiurus cinereus*), a migratory species; and the evening bat (*Nycticeius humeralis*), a woodland species. Though not recorded in the area, the federal endangered Indiana bat (*Myotis sodalis*) may also occur in the region.

The house mouse (*Mus musculus*) and the Norway rat (*Rattus norvegicus*), non-native mammals, are documented on post. These animals, along with the woodchuck, can cause damage in the cantonment area. Other problematic mammal species include feral dogs and feral cats. Feral cats are of particular concern because of the risk of disease (e.g., rabies) they pose to humans and pets, and because of their documented devastation of ground nesting birds and small mammals. Fort Belvoir Regulation 40-905, *Animal Control* (U.S. Army, 2000c), prohibits the abandonment of any animal on the installation and outlines procedures if stray animals are found.

7.2.2 Birds

The birds of Fort Belvoir are very well documented. Information on the species and abundance of birds on post has been collected through a number of surveys and monitoring efforts undertaken by the installation, as well as by various birding organizations and individuals (Table 7-2).

Since 1998 multiple surveys have been conducted to include winter, spring migration, summer breeding and fall migration for landbirds, and surveys for waterfowl, shorebirds, marsh-birds, and nightjars. These major survey efforts were designed and implemented not only to develop a comprehensive species list, but also to assess the relative abundance of bird species, determine the association of species with habitat types, identify trends in populations and distribution over time, and for habitat management. The data from these surveys have been incorporated into the installation GIS. Fort Belvoir plans to continue to conduct the winter, spring migration, summer breeding, marsh-bird, and nightjar surveys as funding and personnel are available.

Other major long-term annual survey events at Fort Belvoir include the Christmas Bird Count (since 1911) and the Northern Virginia Bird Survey (since 1995). The Christmas Bird Count is organized by the National Audubon Society with installation staff participation. In 1998, the Northern Virginia Bird Survey, which was originally initiated by the Audubon Society of Northern Virginia (ASNV), was incorporated into Fort Belvoir's land bird survey, and is now being performed by Fort Belvoir staff. Data from these surveys are being incorporated into the installation GIS and provided to ASNV.

As a result of the many surveys and observations over the years, a total of 278 bird species have been identified on Fort Belvoir. Appendix I presents the species identified on post, together with information on their seasonal abundance. Appendix J presents the Fort Belvoir bird checklist, which provides more detailed information on the seasonal relative abundance. This large number of bird species on Fort Belvoir reflects the variety and quality of natural habitats at the installation.

Thirty-two percent (88 species) of Fort Belvoir bird species are year-round residents, twenty-six percent (71 species) are neotropical migrants, and thirty-six percent (101 species) are temperate migrants. The most abundant resident landbirds on Fort Belvoir are the red-bellied woodpecker (*Melanerpes carolinus*), American crow (*Corvus brachyrhynchos)*, tufted titmouse (*Parus bicolor*), and Northern cardinal (*Cardinalis cardinalis*). The most abundant resident waterbirds are the great blue heron (*Ardea herodias*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), and wood duck *(Aix sponsa*). During the winter, common temperate migrants include the American robin (*Turdus migratorius*), dark-eyed junco (*Junco hyemalis*), ring-billed gull (*Larus delawarensis*), and white-throated sparrow (*Zonotrichia albicollis*). Abundant neotropical migrants that use the installation as stopover habitat during migration include the black-throated blue warbler (*Dendroica caerulescens*), black-throated green warbler (*Dendroica virens*), blackpoll warbler (*Dendroica striata*), and American redstart (*Setophaga ruticilla*). The most abundant neotropical migrants breeding on Fort Belvoir include the red-eyed vireo (*Vireo olivaceus*), Acadian flycatcher (*Empidonax virescens*), ovenbird (*Seiurus aurocapillus*), wood thrush (*Hylocichla mustelina*) and indigo bunting (*Passerina cyanea*).

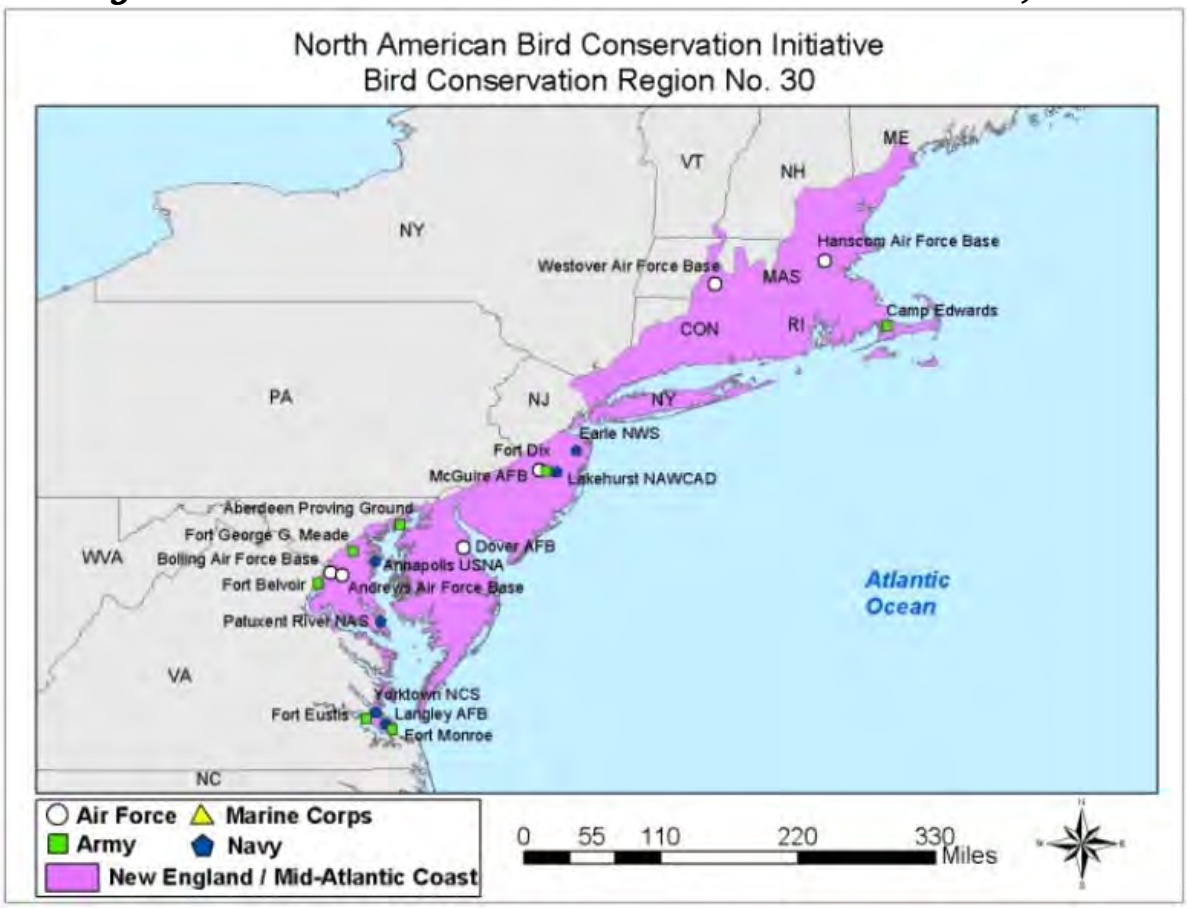
Thirty-six percent (99 species) are known to be common or abundant at the times they occur on post (Fleming, 2005). This indicates that Fort Belvoir affords large areas of suitable habitat for a significant percentage of the installation bird species. Key habitat features on Fort Belvoir include the large contiguous areas of undeveloped land, the landscape of varied ecological communities (e.g., freshwater tidal marsh that is used by killdeer (*Charadrius vociferus*), greater yellowlegs (*Tringa melanoleuca*) and lesser yellowlegs (*Tringa flavipes*), spotted sandpiper (*Actitis macularia*), and least sandpiper (*Calidris minutilla*)); the early

successional old-field habitats used by prairie warblers and field sparrows (*Spizella pusilla*); the later successional old-field habitats used by yellow-breasted chat (*Icteria virens*), white-eyed vireo (*Vireo griseus*), and eastern towhee (*Pipilo erythrophthalmus*); the forested wetland/riparian forest used by the prothonotary warbler, Acadian flycatcher, yellow-throated vireo (*Vireo flavifrons*), Carolina chickadee (*Poecile carolinensis*), and Louisiana waterthrush (*Parkesia motacilla*); the upland hardwood forest used by the wood thrush, worm-eating warbler (*Helmitheros vermivorous*), eastern wood-pewee (*Contopus virens*), scarlet tanager (*Piranga olivacea*), and summer tanager (*Piranga rubra*); and the abundance of food sources (e.g., soft-bodied insects, seeds, berries, aquatic invertebrates). These habitats, together with Fort Belvoir's position along the Potomac River corridor, enhance the installation's attraction for both resident and migrant species.

The USFWS Information, Planning, and Conservation System (IPaC) tool (accessed 4/27/2017) identified 11 species on the Birds of Conservation Concern list in the vicinity of Fort Belvoir. The USFWS Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that are of conservation or management concern due to low numbers, declining population trends, or recent delisting. For the Fort Belvoir area of Virginia this list includes the species listed in Table 7-3. The last column in the table addresses the occurrence of each species on Fort Belvoir based on ecological requirements, habitat available, and survey data.

PIF utilizes the best, most up-to-date science to assess the vulnerability of all landbirds. The PIF 2016 Species of Concern "Watch List" identifies 86 species of highest conservation concern. All of these birds will require immediate and coordinated actions across their full range and life cycles to reduce threats, reverse declines, and prevent future extinctions. The North American Bird Conservation Initiative (NABCI) established Bird Conservation Regions (BCRs) as ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. PIF utilizes these BCRs to identify and prioritize management of these species. Fort Belvoir falls within BCR 30, New England/Mid-Atlantic Coast (Figure 7.1). The six birds on the PIF Species of Concern Watch List that occur within BCR 30 are listed in Table 7-3. Fort Belvoir is using three of the species – prairie warbler, prothonotary warbler, and wood thrush – as indicator species in the installation's wildlife management program.

Figure 7.1: North American Bird Conservation Initiative, BCR 30



The DoD has intrinsic mission and conservation issues, both of which require due diligence to laws and regulations to promote mission capabilities. Thus DoD Partners in Flight created its own list of *Mission Sensitive Species (MSS)* to provide focus on those species most relevant to protecting the DoD missions. This list highlights bird species that occur on DoD lands and are at risk of becoming listed as threatened or endangered under the federal Endangered Species Act. The purpose of this list is to help DoD resource managers better prioritize monitoring and management efforts on those species (and their habitats) having the highest potential to impact the military mission should they become federally listed. The list helps installations prioritize monitoring programs and NEPA documents, and guides the development of conservation actions to support Executive Order 13186 (*Responsibilities of Federal Agencies To Protect Migratory Birds*), the associated Memorandum of Understanding with USFWS, and the Final Migratory Bird ("Readiness") Rule. Table 7-3 lists the ten mission sensitive species that occur on Fort Belvoir.

Table 7-3: Fort Belvoir Birds of Management Concern						
Common Name	**Scientific Name**	**USFWS[1] BCC**	**PIF[2] SOC**	**DoD[3] MSS**	**Season**	**Occurrence[4]**
Bald Eagle	*Haliaeetus leucocephalus*	*			Year-round	Common
Black-billed Cuckoo	*Coccyzus erythropthalmus*	*	*	*	Breeding	One record in 20 years
Blue-winged Warbler	*Vermivora pinus*	*		*	Breeding	Not likely, annual migrant
Cerulean Warbler	*Dendroica cerulea*			*	Breeding	Not likely, near annual migrant
Fox Sparrow	*Passerella iliaca*	*			Wintering	Annual
Kentucky Warbler	*Oporornis formosus*	*	*	*	Breeding	Ten records in 20 years
Least Bittern	*Ixobrychus exilis*	*			Breeding	Two records in 30 years
Peregrine Falcon	*Falco peregrinus*	*			Wintering	Near annual
Prairie Warbler	*Setophaga discolor*	*	*	*	Breeding	Annual but declining
Prothonotary Warbler	*Protonotaria citrea*	*	*	*	Breeding	Annual but declining
Red-headed Woodpecker	*Melanerpes erythrocephalus*	*		*	Year-round	One breeding record, near annual winter resident
Rusty Blackbird	*Euphagus carolinus*	*		*	Wintering	Near annual
Short-eared Owl	*Asio flammeus*	*			Wintering	Not likely, possible in county
Willow Flycatcher	*Empidonax traillii*	*			Breeding	Possible, known in county
Wood Thrush	*Hylocichla mustelina*	*	*	*	Breeding	Common
Worm Eating Warbler	*Helmitheros vermivorum*	*			Breeding	Annual
Grasshopper Sparrow	*Ammodramus savannarum*			*	Breeding	Annual
Eastern Whip-poor-will	*Caprimulgus vociferus*		*		Breeding	Historic annual breeder but not in last nine years

[1]USFWS BCC = U.S. Fish and Wildlife Service, Birds of Conservation Concern 2008. Note – Bird list generated from IPaC 2017.
[2]PIF SOC = Partners In Flight, Species of Concern, Bird Conservation Region 30, 2016.
[3]DoD MSS = Department of Defense PIF Mission Sensitive Species DRAFT 2017.
[4]Occurrence = Derived from Fort Belvoir migratory bird survey data.

Figure 7.2 Fort Belvoir Breeding Birds of Management Concern, depicts those species documented during the breeding season that are on each of the following lists: USFWS Birds of Conservation Concern (BCC), PIF Species of Concern (SOC) BCR30, DoD PIF Mission Sensitive Species (MSS) as well as Fort Belvoir Habitat Indicator Species. A 500 foot buffer is established by the Fort Belvoir GIS and used to indicate the locations where the species have been documented and the potential for nesting and foraging areas. These buffers indicate suitable breeding habitat for the documented species and avoidance and/or mitigation for removal of habitat during mission activities (e.g., construction) is recommended. Some buffers have been altered or adjusted to incorporate habitat changes or less desirable habitat conditions.

In addition, PIF has identified monitoring and management recommendations for several species of common birds that are in steep decline. The following birds that have been found on Fort Belvoir fall into this category for BCR 30: chuck-will's-widow (*Caprmulgus carolinensis*), chimney swift (*Chaetura pelagica*), field sparrow (*Spizella pusilla*), northern bobwhite (*Colinus virginianus*), yellow-billed cuckoo (*Coccyzus americanus*), and common grackle (*Quiscalus quiscula*).

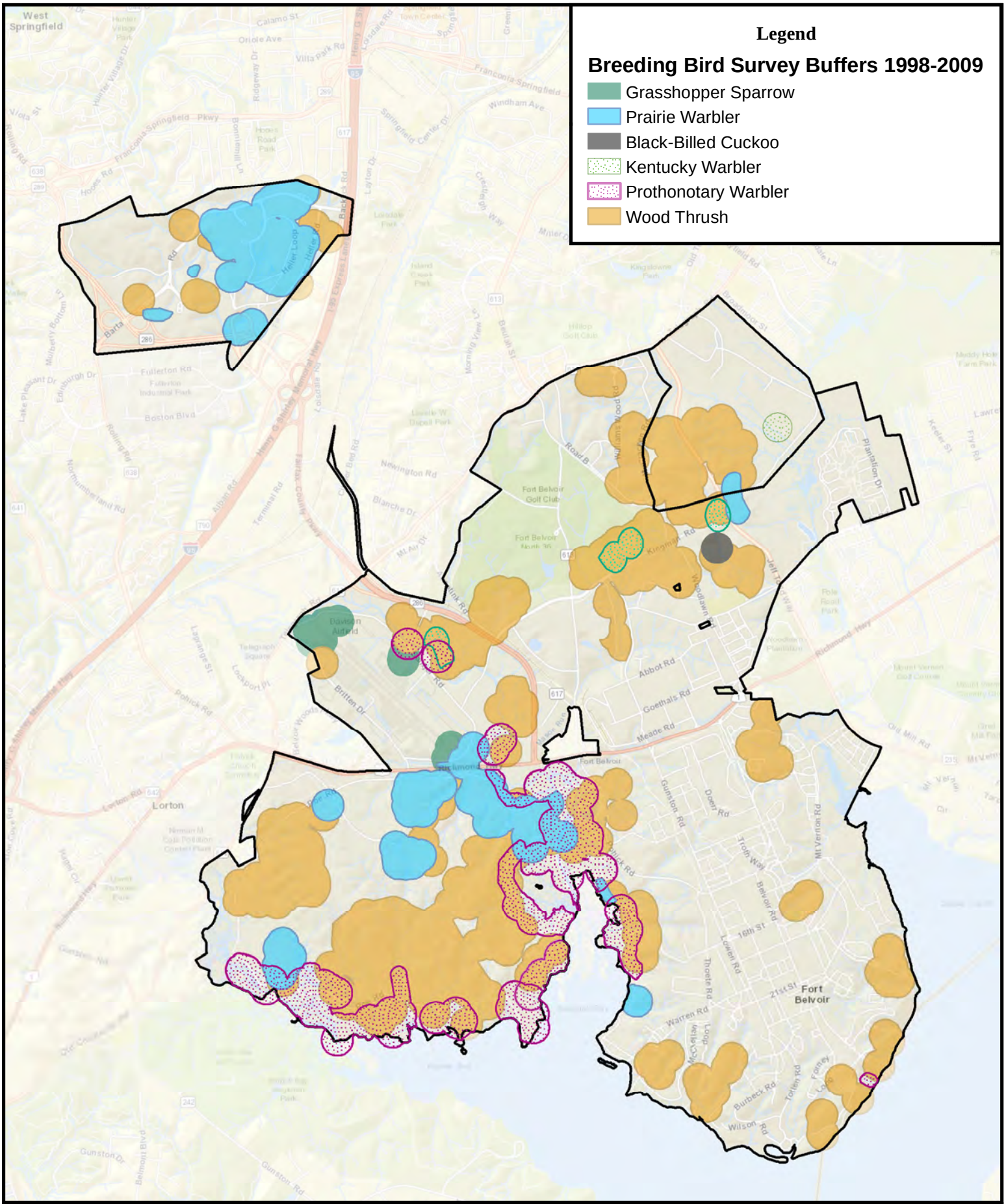
7.2.3 Reptiles

The reptile species present at Fort Belvoir have been well-documented through various field surveys (Table 7-2). The data provide an inventory of reptile species occurring or potentially occurring on the installation; however, study limitations preclude detailed abundance and distribution analysis. Data from these surveys have been incorporated into the installation GIS.

Thirty-four species of reptiles have been identified as occurring or likely to occur, on Fort Belvoir: 12 turtles, 18 snakes and four lizards. These species are all typical of the northern Virginia upper Coastal Plain, although several are at the limits of their ranges. Appendix I presents more specific information on the abundance of Fort Belvoir reptiles. The only venomous snake endemic to Fort Belvoir is the northern copperhead (*Agkistrodon contortix*), which occurs most often in moist deciduous/mixed woods, but is a habitat generalist.

The wood turtle, a state-listed threatened species, occurs at Fort Belvoir (Section 8.2.6). Several individuals of this species have been observed at various locations along the Dogue Creek and Accotink Creek drainages, indicating an on-post population. The spotted turtle, while abundant on Fort Belvoir, is decreasing throughout its range and as of April 2017 has been added to the National Listing Workplan to evaluate the species' need for federal protection.

Field observations indicate that turtles experience high mortality on post from motor vehicle impact and from predation. Raccoons, foxes, skunks, and snakes all prey upon turtle eggs. Young turtles are preyed upon by these animals, as



BREEDING BIRDS OF MANAGEMENT CONCERN ON FORT BELVOIR

Figure 7.2

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Source: Fort Belvoir GIS, Google road maps

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well as by predatory fishes and various birds. Turtles of all ages appear to be a major prey of raptors such as bald eagles.

7.2.4 Amphibians

The amphibian species present at Fort Belvoir have been well documented (Table 7-2). These studies have provided information on populations and distribution. Amphibian data have been incorporated into the installation GIS.

Twenty-seven species of amphibians have been identified as occurring, or potentially occurring, on Fort Belvoir: 12 frogs, three toads and 12 salamanders. Appendix I, presents more-specific information on the abundance of Fort Belvoir amphibians.

Amphibians have complex habitat requirements because of their dual life histories, living part of their lives in aquatic environments and part of their lives in terrestrial environments. The natural mosaic of aquatic and woodland habitats at Fort Belvoir, including the extensive wetland areas, woodlands traversed by extensive drainage systems, and ephemeral ponds (including man-made depressions, such as ditches and tire ruts along the unpaved training area roads) provide extensive areas of suitable amphibian habitat. Microhabitat conditions (e.g., extensive leaf litter, woodland debris, such as fallen logs, and undercut banks in the natural areas on-post) enhance the quality of this habitat. Fort Belvoir's relatively rich amphibian population is vulnerable to losses from predation, disease, climatic and/or physical land surface changes (e.g., development, loss of cover) that cause loss of surface waters or loss of natural ground-level humidity at the forest floor, fragmentation of habitat, and disruption of natural travel corridors.

7.2.5 Fish

A total of 65 species of fish have been identified using baseline fish surveys. The predominant groups of fish in Fort Belvoir waterways, both in numbers of species and in abundance are cyprinids (minnows) and centrarchids (sunfish). These two groups typically dominate eastern North American waterways (Ernst et al., 1995). Other dominant fish species in Fort Belvoir waterways are banded killifish (*Fundulus diaphanus*), yellow perch (*Perca flavescens*), white perch (*Morone americana*), and American eel (*Anguilla rostrata*). Minnows comprise the majority of the fish in all installation waterways during spring and summer, while killifish dominate in the fall. Sunfish, perch and American eel are abundant year-round, as are blacknose dace (*Rhinichthys atratulus*), rosyside dace (*Clinostomus funduloides*), creek chub (*Semotilus atromaculatus*) and tesselated darter (*Etheostoma olmstedi*). Shiners - spottail shiner (*Notropis hudsonius*) and spotfin shiner (*Cyprinella spiloptera*) are among the abundant fish species during the summer (EA, 1998; 1999b, c; 2000).

Two species of river herring - alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) are documented to migrate up Accotink Creek and Dogue Creek during the spawning season although they do not appear to travel far up installation creeks (EA, 1999a; 2000). Alewives are the most abundant. Blueback herring were documented using installation creeks for the first time in 1999 (EA, 1999a). (Both are documented spawners in Gunston Cove [Jones and Kelso, 1998].) American and hickory shad (*Alosa sapidissima* and *Alosa mediocris*), while identified locally in the Potomac River, are more deep-water spawners and are not expected to occur in Fort Belvoir waterways. Gizzard shad (*Dorosoma cepedianum*), a semi-anadromous species, is another common spawner within Fort Belvoir waterways.

Long-term monitoring of Gunston Cove reveals the most abundant spawners to be river herring (alewife, blueback herring), gizzard shad, the semi-anadromous white perch and various sunfish (Jones and Kelso, 1998). Gunston Cove is recognized as a rich nursery area for these species. White perch is the dominant fish species of Gunston Cove over much of the year. Other abundant species within Gunston Cove include channel catfish (*Ictalurus punctatus*), spottail shiner, bay anchovy (*Anchoa mitchilli*), brown bullhead (*Ameiurus nebulosus*), pumpkinseed (*Lepomis gibbosus*), tesselated darter, yellow perch, inland silverside (*Menidia beryllina*), mummichog (*Fundulus heteroclitus*), and golden shiner (*Notemigonus crysoleucas*) (Jones and Kelso, 1998).

The fish community in Fort Belvoir waterways is a diverse assemblage, which is characteristic of Coastal Plain streams. The species of fish identified in the Fort Belvoir waterways and in Gunston Cove are typical in this region. Natural conditions dictate that the species must be tolerant of warm water, low baseline flow, silty/sandy substrate, instream snags/debris, and other conditions common to large, slow moving upper Coastal Plain streams that are fed by a network of small, short reaching tributaries. Fishes in these waterways must also be tolerant of conditions (e.g., dramatic, ongoing in-stream and bank erosion, siltation, sedimentation, etc.) caused by excessive/un-moderated stormwater flows from developed land areas both on and off the installation, as well as chemical inputs from surrounding urban development. Pohick Creek, in particular, is strongly influenced by the discharge of the Noman M. Cole, Jr. Pollution Control Plant located just outside the installation boundary. The fishes in these waterways are also subject to habitat changes caused by beaver activity. Nonetheless, the surveys did report that several species typical to Piedmont streams do occur in Accotink and Dogue Creek.

The smaller tributary streams surveyed during the baseline inventory reported a less diverse fish assemblage than that of the main installation waterways (EA, 2000). This is probably related to limitations in habitat availability (e.g., very small streams, lack of pools) in these small waterways, although there may be potential water quality problems influenced by stormwater or other inputs from

the installation. The results of the baseline inventory indicated the occurrence of a viable and substantial anadromous fish migration (especially the herring and perches) up both Accotink and Dogue Creeks (EA, 1999a; 2000).

There are no dams or obstructions within the three main creeks through Fort Belvoir that prohibit anadromous fish passage up Pohick, Accotink and Dogue Creeks through the installation (Figure 5.4). However a small concrete structure located along Dogue Creek just upstream of the U.S. Route 1 creek crossing (outside of Fort Belvoir boundary) does impede anadromous fish passage. The small size and the intermittent flow conditions of most of the small tributaries on Fort Belvoir preclude all but the smallest fish species. At several locations on the tributary waterways, excessive sedimentation at the mouth of the tributary, or culvert blockages, appear to preclude all fish passage (EA, 2000).

Sub-watershed 48 (also known as stream UN-1) (Figure 5.2) located in the southwest training area is unique for Fort Belvoir. This stream traverses a large undeveloped portion of Fort Belvoir and is not severely influenced by stormwater or other anthropogenic factors. The fish fauna of UN-1 contain healthy populations of American brook lamprey (*Lampetra appendix*). UN-1 is the only stream on post to yield eastern mudminnows (*Umbra pygmaea*) (EA, 1998; 1999b,c; 2000). Both of these species are indicators of good water quality and unaltered channels.

Fort Belvoir has very little permanent pond habitat. The only ponds (excluding beaver ponds) on post considered capable of supporting fish are (1) the less than one-acre pond at the North Post golf course; (2) the less than one-acre stormwater management pond at INSCOM; and (3) the two-acre Mulligan Pond at JMAWR. Ernst et al. (1995) reported that these ponds had been stocked in the past with sunfish, perch, or largemouth bass (*Micropterus salmoides*). An early spring fish survey of Mulligan Pond conducted in 1999 by the VDGIF found gizzard shad, largemouth bass, black crappie (*Pomoxis nigromaculatus*), common carp (*Cyprinus carpio*), and various sunfish (unpublished data). Neither of the other ponds have been surveyed within the past 25 years. However, in the summer of 2015 the INSCOM pond was drained for dam renovations. The renovation revealed a large number of sunfish and largemouth bass as well as channel catfish. The pond was seined to remove as many fish as possible and all fish were stocked into Mulligan Pond.

None of the fish identified in Fort Belvoir waterways or ponds have federal or state threatened or endangered designations. The only such species identified in this region is the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*), which occur in the deeper waters of the Potomac River. These species are not expected to occur within Fort Belvoir waters. One state species of concern, the bridle shiner (*Notropis bifrenatus*), has been identified in several locations in Accotink and Dogue Creeks. The bridle

shiner was more abundant in Accotink Creek where it was collected in various types of habitat (EA, 2000). This species is found in slow moving streams and creeks and it rarely enters tidal or brackish water.

In 2004 the invasive-exotic northern snakehead (*Channa argus*) was discovered in Virginia and is found in the Potomac River from the Great Falls area downstream to the Chesapeake Bay. Snakeheads have been found in all three main tributaries of Fort Belvoir (Accotink, Pohick, and Dogue Creeks). Data collected in 2014 suggests relative abundance had stabilized and even declined slightly in waters where populations have been established the longest. Through continued sampling and efforts to learn more about the ecology and biology, attempts are being made to determine what impacts, if any, are occurring to aquatic communities as a result of colonization (VA DGIF 2017a).

7.3 FISH AND WILDLIFE MANAGEMENT

7.3.1 Wildlife Management Focus

Fort Belvoir manages its fish and wildlife resources in accordance with the resource conservation and multiple use requirements of the Sikes Act, DoDI 4715.03, and AR 200-1 as well as the plans identified in the Virginia *Wildlife Action Plan of 2015* (VDGIF, 2015). Management actions to date have prioritized conservation of ecologically significant fish and wildlife resources, while supporting the military mission and providing public access to installation fish and wildlife resources (as long as the access is consistent with natural resource management objectives, military mission and operations and security requirements).

The *Virginia Wildlife Action Plan of 2015* identifies species that are critically imperiled or in decline in Virginia, and identifies strategies to conserve and restore these species. In addition to a statewide overview, the plan describes strategies for 21 planning regions that identify: local wildlife priorities, the habitats those species rely upon, threats impacting these species and their habitats, and conservation actions that can be taken to address those threats. For each planning region it also identifies priorities set for either conservation or restoration; programs working to address threats or define best management practices; and, data that could be used to document and evaluate the success of conservation actions. Lastly, the plan describes climate trends that have been projected for Virginia and identifies actions that can be taken to conserve wildlife under changing climatic conditions.

Fort Belvoir follows an ecosystem-based approach to fish and wildlife management. In establishing fish and wildlife management policies and identifying and selecting management actions, Fort Belvoir addresses the installation's biological resources in terms of their landscape setting (local,

regional, and national). Fort Belvoir's overall fish and wildlife management policies are to conserve and enhance healthy native fish and wildlife communities, rather than emphasizing single-species or game species management or production.

Fort Belvoir's management program recognizes the importance of understanding native habitats, and managing or responding to the forces that influence those habitats. Fort Belvoir's management program focuses on (1) conserving natural habitats in the size and configuration that best supports native fish and wildlife populations; (2) eliminating, minimizing, or offsetting habitat disruptions such as forest fragmentation, and damage by overabundant species; (3) enhancing habitat conditions for species and suites of species having recognized conservation priority, such as threatened, endangered, and species of concern; and (4) using indicator species to evaluate and set priorities for manipulation of habitat conditions.

Fort Belvoir's fish and wildlife management program stresses balancing public access to and use of fish and wildlife resources with preservation of functional ecosystems and the maintenance of military training and testing capacity. Public access to fish and wildlife habitats is provided in the three installation refuges and along much of the approximately 12 miles of the installation's shoreline. Fort Belvoir allows public access to these areas for a variety of non-consumptive recreational uses, such as wildlife viewing, hiking, and nature photography, as well as consumptive uses such as hunting and fishing (Sections 9 and 10).

7.3.2 Fish, Wildlife, and Habitat Management Actions to Date

The following sections present specific information on Fort Belvoir's fish, wildlife, and habitat management actions to date (Table 7-4). Management actions for endangered and threatened species are addressed in Section 8. Figure 7.3 has the location of the PIF mitigation sites and Table 7-4 identifies the habitat, size, and whether the project was a NEPA mitigation or stewardship project. Management actions for the installation refuges and corridors are addressed in Section 9.0.

Table 7-4: Wildlife and Habitat Management Actions to Date						
Project	**Location**	**Year**	**Species Benefitted**	**Acres Affected**	**Mitigation Stewardship/ Action**	**Mission Benefit**
Early Successional habitat creation	T-9 ABWR	2007, 2015	PIF-SOC, Early Successional wildlife, reptiles/amphibians	12 (2007) 35 (2015)	Mitigation-BRAC 2005, RPMP	Long Range antennae communication testing, Landing Zone Clearance
Pine Thinning	T-8	2017	PIF-SOC, reptiles/amphibians	5.5	Stewardship	Land Navigation Course
Early Successional habitat creation	FBNA	2017	PIF-SOC, reptiles/amphibians	10	Stewardship	Increasing Early Successional Habitat to meet INRMP goals
Early Successional habitat creation	T6-B and W-1 ABWR	2010	PIF-SOC, early successional wildlife, pollinators	13	Mitigation-BRAC 2005	Maintenance of early successional habitat to meet INRMP goals
Tree thinning, shrub and wildflower planting	W-1 ABWR	2005	PIF-SOC, early successional wildlife, pollinators	8	Stewardship-Legacy National Public Lands Day	Early successional habitat to meet INRMP goals
Enlarged Culvert Installation	Pohick Road and Gunston Road FWC	2011	Large/small mammals, reptiles/amphibians	N/A	Mitigation-BRAC 2005	Reduce wildlife/vehicle collision in support of INRMP goals
Enlarged Culvert Installation	Jeff Todd Way (Mulligan Rd)	2013	Large/small mammals, reptiles/amphibians	N/A	Mitigation-construction of Jeff Todd Way (Mulligan Rd)	Reduce wildlife/vehicle collision in support of INRMP goals

Table 7-4: Wildlife and Habitat Management Actions to Date						
Project	**Location**	**Year**	**Species Benefitted**	**Acres Affected**	**Mitigation Stewardship/ Action**	**Mission Benefit**
Wildlife Crossing Structures	U.S. Route 1 and FWC	1994-present	Large/small mammals, reptiles/amphibians, fish, birds	N/A	Mitigation-widening of U.S. Route 1 and FWC	Reduce wildlife/vehicle collision in support of INRMP goals
Native wildlife seed mixes	W-4, Mulligan Road landfill-FWC	2013	Grassland wildlife, pollinators	1	Stewardship-use of native wildlife seed mixes in lieu of fescue	Meet erosion and sediment (E&S) control requirements and in support of INRMP goals
Native wildflower seed mixes	W-3, Pohick Rd	2015	Pollinators	0.25	Stewardship-use of native wildflower mixes to benefit pollinators	Meet E&S control goals and in support of INRMP goals
Native wildlife seed mixes, tree planting	Fort Belvoir Community Hospital, Dental Clinic, North Atlantic Regional Medical Clinic	2012	Pollinators and meadow generalists	24	Mitigation-BRAC 2005	Obtain LEED Silver certification with U.S. Green Building Council and in support of INRMP goals
Understory creation	W-1, McCarty Trail-ABWR	2010	PIF-SOC and understory generalists	8	Mitigation-BRAC 2005	In support of INRMP goals

Table 7-4: Wildlife and Habitat Management Actions to Date						
Project	**Location**	**Year**	**Species Benefitted**	**Acres Affected**	**Mitigation Stewardship/ Action**	**Mission Benefit**
Native Warm Season Grass and small shrubs/trees planting	T-6B, W-1, and W-6-ABWR	2010	PIF-SOC and early successional wildlife, pollinators	3	Mitigation-BRAC 2005	In support of INRMP goals
Pine Thinning	W-5 & W-1 ABWR	1999	T&E Species- Bald Eagle	20	Stewardship	Support to T&E species-Bald Eagle
Early successional habitat, old-field grassland	W-6 ABWR	2003, 2010	PIF-SOC and early successional wildlife	1	Stewardship (2003)- Boy Scout conservation project, Mitigation (2010) BRAC 2005	In support of INRMP goals
Early successional habitat, old-field grassland	T-6B & T-8 ABWR and landfills	2014	PIF-SOC and early successional wildlife, pollinators	3.5	Mitigation-BRAC 2005	In support of INRMP goals
Wildflower meadows	JMAWR	2013	Pollinators	0.1	Stewardship-Eagle Scout project	In support of INRMP goals
Wetland planting/ creation	Tompkins Basin	2012	Pollinators, reptiles/amphibians	0.1	Stewardship-Earth Day volunteers	In support of INRMP goals
Tree planting in bio-retention ponds	DFMWR-RV Travel Camp	2014-2016	Pollinators and water quality	1	Stewardship-Earth Day volunteers,	In support of INRMP goals

Table 7-4: Wildlife and Habitat Management Actions to Date						
Project	**Location**	**Year**	**Species Benefitted**	**Acres Affected**	**Mitigation Stewardship/ Action**	**Mission Benefit**
					Cub Scout group	
Early successional habitat, old-field grassland	W-3 Basin Trail, ABWR	2010	PIF-SOC, early successional generalists, pollinators	2.5	Mitigation-BRAC 2005	In support of INRMP goals
Early successional conservation areas	Fort Belvoir Golf Course complex	2002	PIF-SOC, early successional generalists, pollinators	5	Stewardship-Audubon Certified Gold Course	In support of INRMP goals
Early successional habitat	H-13, FWC	1996, 2014, 2015	PIF-SOC, early successional generalists	3	Mitigation-BRAC 1988, BRAC 2005	In support of INRMP goals and FWC Management Plan
Invasives Removal	T-17	2012	Native species	0.1	Stewardship-Legacy National Public Lands Day	In support of INRMP goals
Early successional habitat, Native Warm Season Grass seed mixes	FBNA	2010-2013	PIF-SOC, early successional generalists, pollinators	40	Mitigation-BRAC 2005	In support of INRMP goals
Invasives Removal, replanted native	Dogue Creek	2004	Native species	1	Stewardship-Legacy National Public Lands Day	In support of INRMP goals

Table 7-4: Wildlife and Habitat Management Actions to Date						
Project	**Location**	**Year**	**Species Benefitted**	**Acres Affected**	**Mitigation Stewardship/ Action**	**Mission Benefit**
wetland plants						
Tree planting	Beulah Rd	2001	General wildlife and pollinators	0.5	Stewardship	In support of INRMP goals and FWC Management Plan
Utility Right-of-ways - Native Warm Season Grass plantings	Installation wide	2011-present	Pollinators and open field grassland species	32+	Stewardship	In support of INRMP goals
Removal of feral animals	Installation wide	On-going	Native species	N/A	Stewardship	In support of INRMP goals
Wildlife disease monitoring and treatment	Installation wide	On-going	All fish and wildlife	N/A	Stewardship	In support of INRMP goals
Problem and dangerous wildlife control	Installation wide	On-going	N/A	N/A	Trapping, removal, euthanasia	In support of INRMP goals and reduce risk to mission, health, life, and safety
Wildlife population control	Installation wide	On-going	White-tailed deer, Canada geese	N/A	Hunting	In support of INRMP goals
Partnering on regional fish and wildlife actions	Installation wide	On-going	White-tailed deer, anadromous fish, mast surveys	N/A		In support of INRMP goals
Invasive Plant Removal	Installation wide	On-going	General wildlife	N/A	Stewardship	In support of INRMP goals, training, aesthetics

Table 7-4: Wildlife and Habitat Management Actions to Date						
Project	**Location**	**Year**	**Species Benefitted**	**Acres Affected**	**Mitigation Stewardship/ Action**	**Mission Benefit**
Nest boxes and osprey platforms	Installation wide	On-going	Birds	N/A	Stewardship	In support of INRMP goals, volunteer utilization
Building design – windows, lighting	Installation wide	On-going	General wildlife, birds	N/A	Stewardship	In support of INRMP goals

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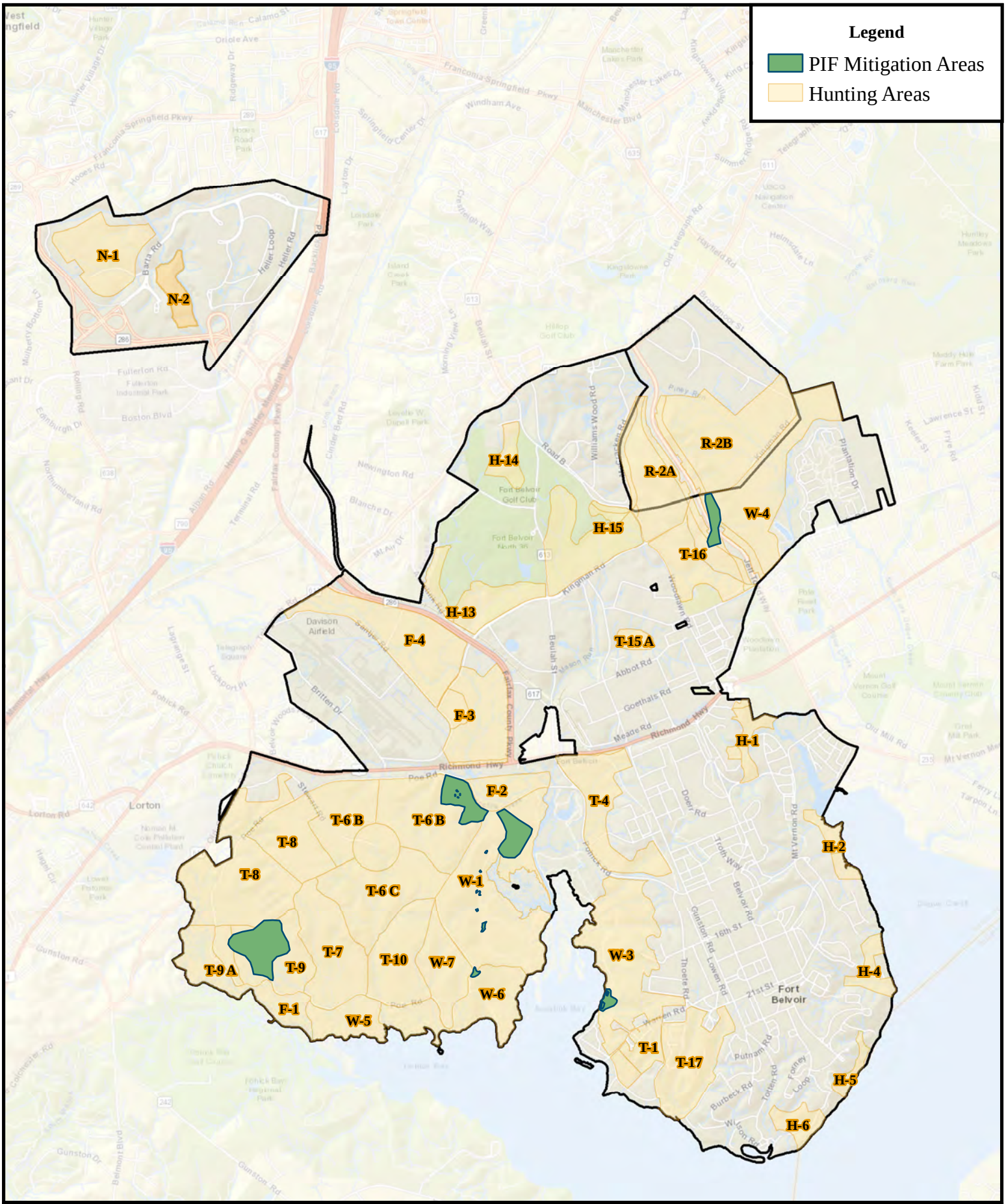

1 inch = 0.75 miles

0 0.25 0.5 1 Miles

PIF MITIGATION AREAS ON FORT BELVOIR

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Figure 7.3

Source: Fort Belvoir GIS, Google road maps,

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7.3.3 Mammal Management

As documented through the baseline surveys, Fort Belvoir supports a fairly diverse mammal community. The baseline survey results indicate that the installation's mammal species are typical of the Northern Virginia area, and that these species appear to be present at the levels of abundance that one would expect for undisturbed habitat in this area. The baseline surveys do not indicate a need for any species or habitat-specific management recommendations for mammals.

The principal management need identified through the baseline surveys is the need to (1) preserve native wildlife habitat on Fort Belvoir, and (2) preserve wildlife movement/migratory corridors within and through the installation. Ernst et al. (1988) documented an area running from the northeast to the southwest through the installation that supported movement of mammals. This report also documented shorter, more localized wildlife movement routes along stream corridors within the installation. The results of this work led to the establishment of the Fort Belvoir FWC (Section 9.0). In addition to the establishment of the FWC, wildlife crossing structures were constructed throughout the installation to enable wildlife passage under roadways that traverse through and alongside the FWC (Figure 9-1).

7.3.3.1 Deer Management

Fort Belvoir recognizes that deer hunting is the only effective, practical and adaptive method available for deer population management. Consequently, Fort Belvoir is using deer hunting, through a bow hunting-only program, as the installation's primary deer management tool. Fort Belvoir uses regulated hunting to manage the effects of deer on other plant and animal communities, and to reduce urban (e.g., vehicle collision, landscape damage), ecosystem, forestry and other types of deer damage. Fort Belvoir's herd reduction goal, which is consistent with Virginia's Deer Management Plan (Deer Management Planning Committee, VDGIF, 1999) as well as the 2015-2024 Deer Management Plan (https://www.dgif.virginia.gov/wildlife/deer/management-plan/), is intended to manage deer at a level most compatible with local social, economic, political, and biological needs, and to preserve native wildlife habitat.

Fort Belvoir has participated in Virginia's Deer Management Assistance Program (DMAP) since 1987. This site-specific program allows more-liberal harvest of antlerless deer than what could be obtained under the existing system of regulations. Deer harvest levels at Fort Belvoir reached a peak in 1999 at 250, and have declined since then, and for the past 5 years have averaged 71. Exclusive use of archery tackle for hunting has proven effective in reducing the installation's deer population level. It is our intention to continue archery only hunting, increasing hunter success through the DMAP, and to continue to

reduce the population. This approach will meet safety constraints and maximize the recreational value of urban hunting.

Fort Belvoir supports periodic deer herd health checks by VDGIF. VDGIF undertakes herd health checks on a periodic basis or as needed. The most recent herd health check was undertaken in March 1999. The results indicated overall poor condition, which is typical in overpopulated areas (Lovelace, 1999). DPW-Environmental Division requested a herd health check in 2015, however, it was determined by VDGIF that a herd health check was not necessary because of the reduction in the deer herd combined with relatively healthy age/sex/weight ratios. In 1999, Fort Belvoir coordinated with VDGIF in responding to a statewide increase in epizootic hemorrhagic disease (EHD), and continues to monitor for such outbreaks as well as chronic wasting disease (CWD).

Deer can present a safety hazard to aircraft operations at Davison Army Airfield (DAAF). Since 1996, Fort Belvoir has operated under wildlife population control permits from VDGIF to remove deer or other wildlife from Davison Army Airfield as needed in response to airfield safety issues. This is covered in the Wildlife Hazard Management Plan (WHMP) for DAAF (Appendix G).

7.3.3.2 Mammal Species of Management Concern

Raccoons are a species of management concern because of their association with rabies. In 1999, Fort Belvoir began participating in a program with Fairfax County to test the effectiveness of oral rabies vaccination on raccoons. Extensive data on raccoon population, movement, and health conditions were collected. Rabies vaccination baits were distributed on Fort Belvoir in the spring and fall of 2000, and in the spring of 2002. A post-treatment survey using trapping techniques indicated that 37% of the installation's raccoon population were successfully vaccinated after the spring 2000 distribution. A post-treatment survey for the fall 2000 distribution was conducted in winter 2000. A post-treatment survey in spring 2002 indicated 55% of trapped raccoons had detectable antibodies. It is expected that other species, such as striped skunk, red fox and gray fox (*Urocyon cinereoargenteus*) also received treatment; however, because these species were not target species in the study, they were not being evaluated in the post-treatment surveys.

Woodchucks are a species of management concern because of their potential for damage to structures, utilities and landscape materials. Fort Belvoir's management actions to date for woodchuck have been to trap and relocate within the installation boundary or euthanize individuals determined to be causing problems or posing safety risks.

Beavers are another species of management concern because of their ability to alter habitats and impact man-made structures. To date, Fort Belvoir's management approach for beaver has been to control the animal's activity rather

than control its population. Management actions are site-specific, such as installation of beaver guards on trees and on wildlife nest box structures to prevent gnawing, and installation of beaver guards on culverts to prevent damming, as well as removal of dam structures when appropriate. Various ecological surveys of Fort Belvoir caution that beaver have the potential to negatively impact habitat for several rare species and plant communities on post (Hobson, 1996; McCoy and Fleming, 2000). These surveys recommend monitoring beaver activity and undertaking control actions if necessary.

Other species of management concern because of their potential for disruption of installation activities or destruction of installation resources include the striped skunk, raccoon, house mouse, Norway rat and feral cats. Skunks, raccoons, and all other native mammals are handled on a case-by-case basis when they become a problem. Fort Belvoir also removes the house mouse and Norway rat as needed to control potential damage.

Feral cats pose a significant threat to native wildlife populations, and pose a safety hazard to installation personnel and their pets due to disease. Scientists estimate that hundreds of millions of birds and small wildlife are killed each year by free-roaming domestic cats (American Bird Conservancy, undated). DoD Instruction 4150.7-1 requires military facilities to use the Armed Forces Pest Management Board Technical Information Memorandum No. 37, *Guidelines For Reducing Feral/Stray Cat Populations On Military Installations in the United States*, as guidance for their feral cat programs. In accordance with this Memorandum, Fort Belvoir Regulation 40-905, *Animal Control* (U.S. Army, 2000c) prohibits the release of domestic animals on post and establishes guidelines for capturing and removing feral animals. This regulation applies to all persons residing on, employed by, serving on, or visiting Fort Belvoir, and it is enforceable by the Fort Belvoir Conservation Law Enforcement Officer and military police. Fort Belvoir's feral cat management to date has been to trap and remove feral cats from the wild. Individual feral cats that can be rehabilitated are put up for adoption; those that cannot are euthanized.

7.3.4 Bird Management

DoD installations must ensure that INRMPs and their NEPA analyses adequately address migratory bird management and regulatory compliance issues.

Migratory birds are protected by a variety of laws and regulations, including the Migratory Bird Treaty Act (16 USC 703-712) and the Bald and Golden Eagle Protection Act. Any actions that result in the take (i.e., to "pursue, hunt, shoot, wound, kill, trap, capture, or collect" 50 C.F.R. § 10.12) of migratory birds or eagles is prohibited unless authorized by USFWS. In 2017 Fort Belvoir created a *Fort Belvoir Conservation of Migratory Birds Policy* Memorandum (Appendix C)

to conserve (avoid, minimize, and manage) migratory bird populations, specifically during construction and maintenance activities.

As of 1998, Fort Belvoir has conducted installation-wide bird monitoring. This effort has been extremely valuable in identifying and evaluating the bird species and their habitat associations at Fort Belvoir. The results of this survey effort document that Fort Belvoir supports a highly diverse bird community, including a significant number of bird species of management priority. The study results leave no doubt as to the high value of Fort Belvoir's natural habitat to migratory bird communities at the regional, national and international levels.

Until 1999, Fort Belvoir's bird-habitat enhancement actions were limited to installing and maintaining nest box structures (e.g., bluebirds, wood ducks, owls, kestrels, prothonotary warblers) and osprey nest platforms; converting manicured lawn areas to old field conditions; and using wildlife seed mixes when re-seeding disturbed areas such as utility rights-of-way and closed landfills.

In 1999, Fort Belvoir began coordination with the PIF program to develop specific management actions for PIF Species of Concern on post. The Avian Inventory, Monitoring, and Management report (Fischer et al., 1999, 2000) identified 10 high priority PIF bird species (now referred to as PIF Species of Concern) that breed on Fort Belvoir. These 10 species have varied habitat requirements. Some, like the wood thrush, require large tracts of undisturbed forest. Others, like the prairie warbler, require areas of early successional vegetation (i.e., a mix of grass with shrub/scrub woody vegetation). Management actions for forest dwelling species can be accomplished through the conservation of the large forest tracts presently occurring on Fort Belvoir and controlling fragmentation. However, management actions for the prairie warbler and other early successional dwelling species, require active management to maintain sufficiently sized areas of early successional vegetation. Since early successional vegetation is a transitional vegetation type, intervention is required to preclude this habitat type from being replaced by forest cover. While these management actions (i.e., conservation of interior forest habitat and maintenance of early successional habitat) have been selected to support PIF Species of Concern, Fort Belvoir recognizes that they will benefit other wildlife species on post. Consequently, Fort Belvoir uses three of the PIF Species of Concern as indicator species for the installation's wildlife management program.

The results of the bird surveys indicate that the cowbird, a nest parasite that poses a significant threat to nesting migrants including several of the PIF bird Species of Concern that breed on Fort Belvoir, occurs throughout the installation and extends into all forest tracts on post. Cowbirds benefit from fragmentation, which occurs throughout the installation. The installation bird surveys (Fisher et al., 1999) recommend eliminating excessive areas of fragmentation to control cowbird intrusion into the installation's forest tracts and to protect vulnerable migratory bird species from nest predation.

7.3.4.1 Bald and Golden Eagles

In the 20th century, the bald eagle was on the brink of extirpation in the contiguous U.S. By the latter part of the century, the population had recovered sufficiently for the bald eagle to be removed from the endangered list and placed on the threatened list (1995). Recovery continued, and the bald eagle was removed from the threatened list in 2007. Although no longer listed under The Endangered Species Act, the bald eagle remains (along with the golden eagle (*Aquila chrysaetos*)) protected under *The Bald and Golden Eagle Protection Act (16 USC 668-668d).*

Fort Belvoir's position along the Potomac River makes it an ideal location for nesting bald eagles (November to July) as well for foraging and roosting eagles, year-round. In 1990, after a multi-decade absence, a bald eagle nest was discovered on post. Fort Belvoir immediately developed and implemented the 1990 *Fort Belvoir Bald Eagle Management Plan* to protect those nesting bald eagles and their nest habitat. In 1997, in recognition of the high use of Fort Belvoir's shoreline by bald eagles year round, VDGIF added the installation shoreline to their designated Mason Neck Eagle Concentration Area (now known as the Potomac River Eagle Concentration Area). Fort Belvoir incorporated the shoreline habitat into a new *Fort Belvoir Bald Eagle Management Plan*, and included that plan as a component of the 2001 INRMP.

As of 2018, Fort Belvoir has 7 active bald eagle nests on post. The USFWS has included Fort Belvoir's shoreline in their designated Potomac River Eagle Concentration Area (the VDGIF eagle concentration area designations are no longer in existence), one of only 3 such designated eagle concentration areas in Virginia. Fort Belvoir has updated the Bald Eagle Management Plan in this INRMP (Table 7-5). Management actions are based upon the more than 2 decades of Fort Belvoir staff monitoring of bald eagles on post, and the Fort Belvoir-specific management guidance from Cline, 1996. Management also took into consideration guidance from the *Bald Eagle Management Plan, National Bald Eagle Management Guidelines* (USFWS, 2007) and *Communal Roosts in Virginia: A Guideline for Landowners* (VDGIF et al., 2012). Fort Belvoir's current Bald Eagle Management Plan retains the 750-foot shoreline buffer and nest buffer distances from the 2001 plan. The plan also retains nesting dates specific to documented bald eagle nests on post.

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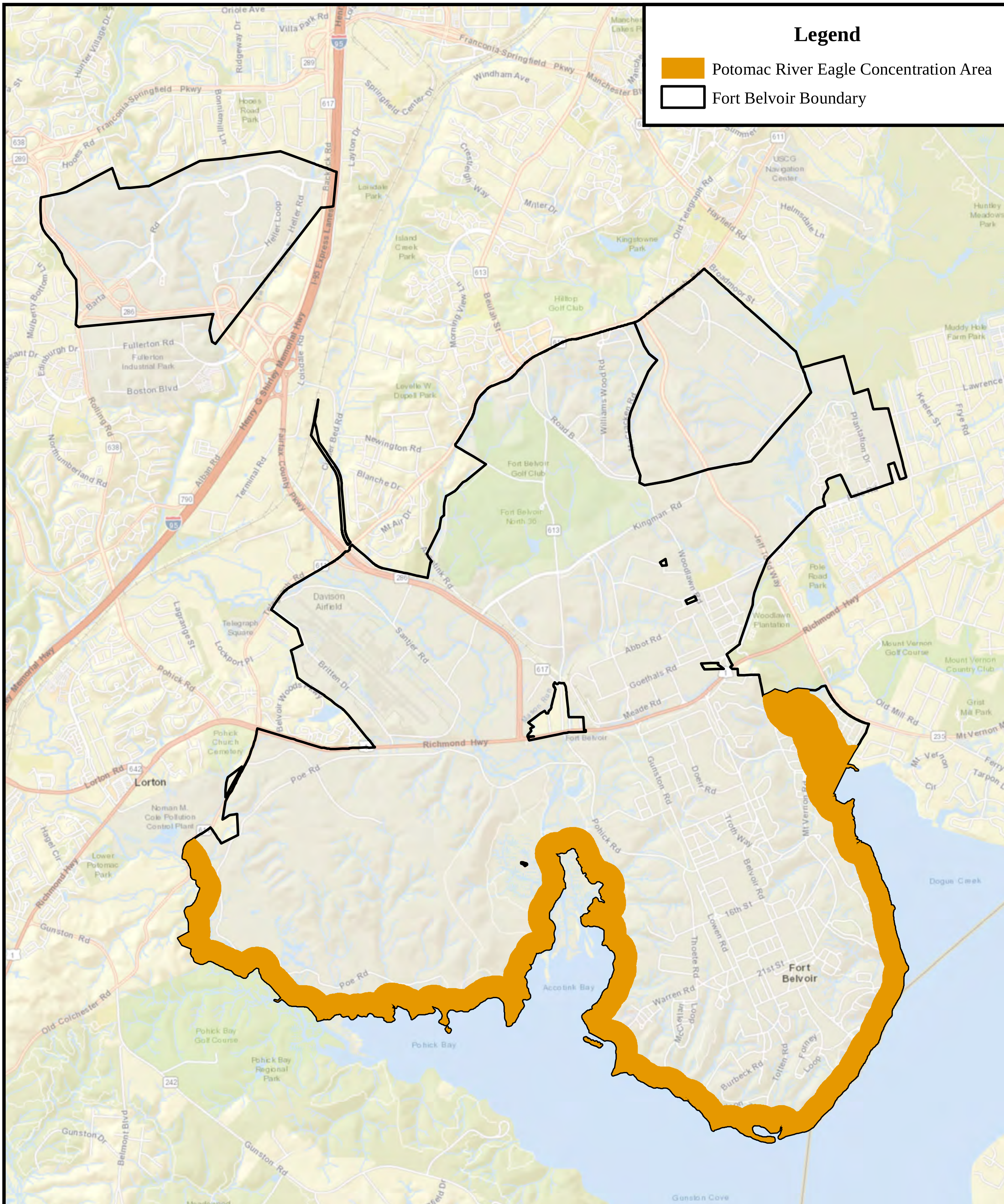

1 inch = 0.75 miles

0 0.25 0.5 1 Miles

BALD EAGLE MANAGEMENT AREAS ON FORT BELVOIR

Unclassified // FOUO

Figure 7.4

Source: USFWS Bald Eagle Buffer, Google road maps

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Table 7-5: Fort Belvoir Bald Eagle Management Actions	
Shoreline habitat/eagle concentration areas	• Perform seasonal foraging habitat surveys • Control invasive vegetation • Reduce electrocution hazards • Rotate waterfowl hunting zones • Eagle concentration areas – protect shoreline management zone by preserving a forested habitat (e.g., no clear cutting or construction) of up to 750 feet inland • Undertake a public information effort to protect eagles from disturbance by human activity • Develop and implement an eagle awareness-training program for installation personnel • Coordinate with USFWS and VDGIF regarding Potomac River eagle activity
Nest Sites	• Establish primary nest management zone at 750 feet radii, respectively, around active nests, and establish land use and activity restrictions (e.g., no clear cutting or construction within the primary zone; no human activity within the primary zone from November 15 through July 15). • Undertake a public information effort to protect eagle foraging habitat from disturbance by human activity. • Establish a rotary-wing flight zone of 500 feet above each nest site and prohibit flight within these zones during nesting season. • Protect active nest sites • Perform nest site and habitat surveys • Protect nest sites for up to 5 years of inactivity • Develop and implement an eagle awareness-training program for installation personnel • Coordinate with USFWS and VDGIF eagle nest location and activity

The golden eagle has been observed at Fort Belvoir but with much less frequency. In the last 50 years it has been identified five times in the month of February. Those that were identified were normally present for at least a day but never more than three days. All sightings were in Accotink and Pohick Bays.

7.3.4.2 Canada Geese

Fort Belvoir has, as does all of northern Virginia, an overabundance of resident Canada geese. The ecological and societal problems resulting from an

overabundance of geese are well documented (Nelson and Oetting, 1998). At Fort Belvoir, geese can also present a serious threat to airfield safety at DAAF. In 1999, in coordination with DAAF, Fort Belvoir developed and implemented a goose hazard management program for the airfield. This program relied upon effective and successful harassment by trained border collies until 2009. Since 1999, the use of bird distress recordings, noise cannons, active harassment by DAAF staff, and habitat manipulation (e.g., maintaining tall grass along runway areas and eliminating open water areas within the airfield's wetland mitigation site) has served as an effective method to deter geese. In 2015 a Wildlife Hazard Management Plan (WHMP) for DAAF was developed to dictate roles/responsibilities of Fort Belvoir staff, identify hazards, and establish procedures found in Appendix G; Fort Belvoir Environmental Division is responsible for implementing wildlife management actions at the airfield. Control of geese elsewhere on the installation where they pose a problem (i.e., North Post golf course and Defense Logistics Agency Headquarters facility) is done through harassment by Fort Belvoir staff and contractors.

7.3.4.3 Wild Turkey

In 2000, at the request of the hunting community and with support from VDGIF, Fort Belvoir added wild turkey (*Meleagris gallopavo*) to the list of species that may be taken by bow hunting during deer season. VDGIF (Gary Norman, 2000) advised that the incidental harvest of wild turkey during the deer-hunting season with archery tackle was not considered to have an effect on turkey populations. VDGIF recommended that all hunters be required to record data from turkey sightings and from harvest, and submit it to the state. Although data from sightings are no longer required, Fort Belvoir does require hunters to submit harvest data. VDGIF also recommended re-evaluation of turkey hunting if the hunters were more successful than anticipated (Gary Norman, 2000). Since the creation of a fall and eventually a spring (2002) turkey hunting season, annual harvests have never exceeded 7 individuals. The taking of male turkeys have little to no effect on turkey populations. Turkey populations are dependent upon adequate nest cover, brood rearing cover, and successful hatch rates.

7.3.4.4 Miscellaneous Bird Management

Other than geese, bird problems during the past five years tend to be site-specific instances. While the DLA Headquarters building experienced a rock pigeon problem because the building's design included extensive ledge areas, most bird problem situations tend to occur when a bird enters an occupied structure, or constructs a nest on the ground in a high traffic area or on a structure where they interfere with installation operations. These instances are handled by protecting the area from disturbance until the hatchlings fledge or the nest is no longer active, or consulting with the USDA (who maintains depredation permits), to remove nests/birds as necessary and in accordance with federal regulations. There have been occasions when ospreys have constructed nests on facilities

and interfered with operations, or presented potential facilities maintenance risks. These situations are handled on a case-by-case basis, and have included removal of nest material during the non-nesting season, and the placement of nest excluders on structures to render the structures unsuitable for osprey nesting (e.g., erecting perch guards, placing nesting platforms adjacent to the electrocution hazard to avoid electrocution). In addition, in areas where high electrocution rates were occurring, electric lines were placed underground and osprey platforms were placed on the poles that had documented osprey electrocutions in these areas.

7.3.5 Reptile and Amphibian Management

The results of the installation surveys indicate that Fort Belvoir possesses very diverse reptile and amphibian communities. The installation survey results emphasize the importance of Fort Belvoir's natural habitat to the conservation of these species. The surveys document how land areas like Fort Belvoir are becoming islands of habitat essential for their continued survival. Reptiles and amphibians, with their limited ranges and complex habitat requirements, are highly vulnerable to the effects of urbanization.

Nationwide, amphibians are recognized as a group of animals experiencing population declines. Additional studies are needed at Fort Belvoir to ascertain whether similar declines are occurring on post. Dr. Joseph Mitchell, University of Richmond, developed a survey protocol for monitoring amphibian populations, which might be appropriate to use at Fort Belvoir (Mitchell, 1998). In addition, a nationwide effort, Partners in Amphibian and Reptile Conservation (PARC), is underway to assess declines in all reptiles and amphibians, and uses the same approach as PIF in utilizing partnerships to more effectively approach conservation efforts.

At Fort Belvoir, the major threats to amphibians and reptiles are disease, habitat loss and fragmentation, and chemical exposures. Amphibians are particularly vulnerable to habitat fragmentation where it eliminates the connectivity among their varied habitat types. Amphibian survival depends upon continuity among wet habitats as well as between upland and wet habitats. Fort Belvoir recognizes the importance of preserving this interface of habitat types. Amphibians are also highly sensitive to environmental chemical contamination, given their physiology and close association with soils and water. Fort Belvoir controls the potential threats from pesticides by following an Integrated Pest Management program (U.S. Army, 2000b) (Appendix D). Another significant threat to amphibians is habitat disruption and degradation caused by stormwater management problems (e.g., sedimentation). Controlling this threat is a major factor in Fort Belvoir's stormwater management program (Section 5).

In 2015 Fort Belvoir began monitoring a reptile/amphibian crossing structure located along Pohick Road. The monitoring effort includes the placement of two motion detecting cameras on either side of the structure set to record migratory movements within the crossing. This project is currently underway with results anticipated to be reported in FY18. In 2017, Fort Belvoir began a reptile/amphibian monitoring project to include four reptile/amphibian call data loggers placed at various locations along transects to record auditory calls. Four transects were established, two that are 1000 meters and two that are 500 meters. Each transect contains survey points 50 meters apart and each point contains two different cover-boards (plywood and carpet), and every third point contains sheet metal as well. Cover-boards are currently being monitored for species abundance and material preference. This effort will be expanded in 2018 to include FBNA.

7.3.6 Fish Management

Although Fort Belvoir does not manage fisheries towards any specific species or population level, the installation does routinely monitor aquatic resources through water quality analysis, institutional research (George Mason University), and through requirements associated with construction projects (wetlands delineation, stream assessments, etc.). The installation has undertaken several fish habitat improvement projects, most notably at Mulligan Pond.

Management is currently passive or as needed on the 3 ponds (Mulligan, North Post Golf Course, and INSCOM) and various streams located on Fort Belvoir. Baseline surveys have been conducted at Mulligan Pond and installation streams but all three ponds and all streams are in need of updating. Fish species and communities that have been found in the ponds and streams are typical of what to expect for the region, thus it has been determined that active management of specific species or communities is not warranted at this time. However, habitat management is of interest and actions such as erosion control, habitat structures, riparian tree plantings, and stream restoration projects are conducted regularly as needed and if funding and resources are available.

7.4 FISH & WILDLIFE MANAGEMENT GOALS, OBJECTIVES, AND STRATEGIES

Fort Belvoir intends to continue the management emphasis and actions addressed in Section 7.3. Fish and wildlife management will continue to follow sound ecological principles to conserve natural resources. Continued support of military training and testing will take primacy. After that, management emphasis will be on conservation and enhancement of water resources in accordance with established DoD and DA natural resources management policies, as well as stewardship programs, such as PIF. Fort Belvoir will continue

to provide the public with opportunities to access installation fish and wildlife resources for recreation, and for conservation education and scientific research and study, consistent with resource conservation goals, and with military mission and operations and security requirements.

7.4.1 Projects

Proposed activities that are considered Projects in this INRMP are activities that may potentially impact the environment and would need to be evaluated for the appropriate level of NEPA documentation. The following goals contain Projects within their objectives or strategies:

Goal 1. Continue to monitor and manage birds listed on the USFWS BCC, DoD PIF MSS, and PIF SOC.

- ***Objective***: Reduce the decline of these species and their habitats because they have the highest potential to impact the military mission should they become federal or state threatened or endangered.
- ***Strategy***: Monitor lists for species status changes and designations and adjust habitat projects and management plans accordingly.

Goal 2: Continue to maintain forested wetland habitat.

- ***Objective***: To support a stable population of 5-8 pairs of prothonotary warblers and 75-100 pairs of Acadian flycatchers.
- ***Strategy***: Identify and conserve existing forested wetland blocks to prevent loss and degradation.

Goal 3: Continue to maintain mixed bottomland and upland hardwood forest habitat.

- ***Objective***: Support a population of 300 pairs of wood thrush.
- ***Strategy***: Identify and maintain existing contiguous blocks of mixed bottomland and upland forest habitat.

Goal 4: Continue to maintain open grasslands.

- ***Objective***: Support 10 pairs of grasshopper sparrows.
- ***Strategy***: Identify, conserve, and/or create/maintain grasslands.

Goal 5: Continue to maintain early-successional/scrub-shrub habitat.

- ***Objective:*** Support 25 pairs of prairie warblers.
- ***Strategy***: Identify, conserve, and/or create/maintain early-successional/scrub-shrub habitat.

Goal 6: Continue to reduce habitat fragmentation

- ***Objective***: Manage small grassland areas (less than 20 acres in size), that are largely within the FWC or refuges, to re-establish later successional conditions to support shrub-dependent birds within the region.

- ***Strategy***: Re-plant, or allow natural regeneration to occur, enabling the small, grassland patches to transition to early-successional/scrub-shrub habitat.

Goal 7: Continue to obtain scientific information on installation fish and wildlife resources

- ***Objective*:** Support our knowledge of biodiversity, to identify stressors and detect changes to biodiversity, and to evaluate effectiveness of management actions.
- ***Strategy***:
  1) Update Planning Level Surveys (PLS) relevant to fish and wildlife management:
     a) Update the herpetofauna PLS.
     b) Update the fish PLS
     c) Update the small mammal inventory
     d) Perform fish and aquatic insect inventory of small installation streams
  2) Perform year-round surveillance (i.e., close observation in lieu of studies or monitoring projects of fish and wildlife conditions throughout the installation. This could include close observation, or monitoring, in lieu of detailed field survey.
  3) Perform insect and pollinator inventory and abundance survey.
  4) Develop and implement protocols for localized and/or issue-specific fish and wildlife surveys and studies as needed to support resource management, or for specific installation projects or mission activities.
  5) Coordinate with DCR-NHP and other entities regarding stewardship of fish and wildlife resources.
  6) Incorporate the location of habitat enhancement projects in the installation GIS.
  7) Perform an annual survey of a representative sample of habitat areas to assess changes, and to assess the success of management actions.
  8) Update and maintain baseline fish and wildlife information in installation documents, records, databases, GIS, etc.
  9) Identify opportunities for fish and wildlife habitat, and other, enhancement projects.
  10) Perform annual bird surveys.
  11) Perform annual bald eagle nest surveys and monitoring.

Goal 8: Continue to protect bald eagles habitat and protect bald eagles from disturbance.

- ***Objective***: Avoid disrupting bald eagle use of installation areas.
- ***Strategy***:
  1) Maintain designated shoreline buffer.

2) Reduce hazards/disruptions to eagle activity (e.g., remove electrocution hazards, control invasive vegetation).
3) Review and manage (e.g., schedule) installation activities (e.g., operations and maintenance, military training, recreation) to avoid potential impacts to bald eagles.
4) Maintain designated nest site buffers.
5) Educate and inform on-post personnel regarding eagle protection requirements.
6) Coordinate with USFWS, VDGIF, and DCR-NHP as required.
7) Monitor bald eagle presence and activity on post.

Goal 9: Continue to preserve wildlife movement/migratory corridors within and through the installation.

- ***Objective***: Offset the ecological impacts of habitat fragmentation caused by major construction, by providing forest habitat connectivity through the installation.
- ***Strategy***:
  1) Maintain continuous areas of natural forest habitat through Fort Belvoir, connecting with forested habitat off-post to the north and south, and facilitating wildlife movement through the installation.
  2) Re-plant disturbed areas within the FWC.
  3) Install and maintain wildlife crossing structures at roads through the FWC.

Goal 10: Continue to protect against loss of native diversity and ecosystem function of Fort Belvoir's fish and wildlife resources.

- ***Objective***: Conserve and enhance areas of ecologically significant fish and wildlife resources as stipulated by regulatory requirement, mitigation commitment, or that have been prioritized for conservation, such as bald eagle.

  Strategy: Identify areas of ecologically significant fish and wildlife resources consistent with DoDI 4715.03 policy for designating specific areas of the installation that warrant species conservation as "Special Natural Areas" (Section 9) if consistent with military mission. Maintain designation of these areas as environmentally constrained to development in the RPMP, and as warranting conservation commitments in other installation plans and documents. Designate new Special Natural Areas where legally obligated to do so.

Goal 11: Continue to emphasize fish and wildlife species that have been prioritized for conservation by federal and state statute or regulation, DoD or DA policy, DoD partnered programs, State Natural Heritage Program, or through recognized importance to regional ecosystem function when making fish and wildlife management decisions.

- ***Objective***: Use these species as habitat indicator species for the development and implementation of habitat enhancement projects, consistent with the principles of ecosystem management.
- ***Strategy***: Maintain current lists of fish and wildlife species as prioritized by regulations and recommendations.

Goal 12: Continue to conserve and enhance native fish and wildlife habitat conditions.

- ***Objective***: Ensure habitat areas are sufficiently sized and positioned, and possess the appropriate conditions to support healthy, self-sustaining native fish and wildlife populations.
- ***Strategy***: Maintain and perform habitat and vegetation assessments every 5 years. Identify and execute habitat improvement projects for species of management priority (e.g., chimney cap removals to support chimney swift, timber stand improvements to establish early successional habitat, etc.).

Goal 13: Continue to maintain appropriate fish and wildlife populations in an urban setting.

- ***Objective***: Protect the military mission and public from hazard or disturbance by fish and wildlife, by reducing the number of human-wildlife conflicts.
- ***Strategy***: Perform fish and wildlife population and hazard assessments, determine and engage appropriate management measures based upon species and associated hazards. Review and respond to requests by military and public regarding fish and wildlife hazards.

Goal 14: Continue to provide opportunities for public access to fish and wildlife by all persons.

- ***Objective***: Promote consumptive and non-consumptive recreation, environmental education and study consistent with resource conservation.
- ***Strategy***: Identify areas of the installation that are appropriate for consumptive and non-consumptive recreation, environmental education and study consistent with resource conservation. Review and respond to requests by the military and public for access to/use of wildlife resources for expansion of consumptive and non-consumptive recreational opportunities (e.g. hunting, fishing, bird watching, wildlife art, etc.)

Goal 15: Continue to control threats to native fish, wildlife, and associated habitats.

- ***Objective***: Protect, conserve, and maintain native fish, wildlife, and associated habitats and prevent displacement of native plants, and consequent impacts on native fish, wildlife, and associated habitats.

- ***Strategy***:
  1) Implement actions to monitor and control invasive species, conserve wetlands and riparian forest buffers, implement watershed conservation and restoration actions, incorporate fish and wildlife considerations into grounds maintenance and forest management, monitor and control wildlife that cause significant habitat destruction/degradation.
  2) Manage pesticide use in accordance with the Fort Belvoir Integrated Pest Management Plan.
  3) Implement efforts to avoid native fish and wildlife habitat loss or fragmentation when planning and constructing new facilities on post.
  4) Use the installation project/activity review processes to incorporate wildlife conservation requirements as appropriate into all phases of facilities planning, construction, renovation, operation, maintenance and demolition activities; in reviewing and supporting military training and testing activities; and, in reviewing and responding to outdoor recreation, environmental education, scientific research and study, and all other types of access and use requests.
  5) Review and revise, as needed, the Fort Belvoir *Policy Memorandum #28, Environmental Policy* (Appendix C), applicable to construction projects to ensure that they include fish and wildlife protection provisions. Develop recommendations to revise the Fort Belvoir Installation Design Guide to include fish and wildlife sensitive facilities siting, design and construction considerations.
  6) Classify open/undeveloped installation areas by their suitability for development and recreation based upon sensitivity and value to fish, wildlife, and associated habitat. This system would identify areas that would least harm Fort Belvoir's fish and wildlife resources if they were to be developed and/or used for recreation. Incorporate fish, wildlife, and associated habitats protection strategies into utilities privatization, and all other privatization and outsourcing actions, as appropriate.
  7) Review and revise as needed the Fort Belvoir environmental protection specifications applicable to construction contracts to ensure that they include appropriate fish and wildlife protection provisions.

Goal 16: Continue to identify and incorporate fish and wildlife habitat enhancement procedures in installation operations.

- ***Objective***: Enhance broad fish and wildlife habitat conditions.
- ***Strategy***: Use native wildlife seed mixes for re-seeding disturbed areas as appropriate, and reduce the location and frequency of mowing and grounds maintenance activities. Remove abandoned impervious surfaces and replant with native, wildlife-friendly species. Use native plants to enhance vegetation within disturbed riparian areas. Replant disturbed areas within the FWC to enhance forest cover conditions.

Goal 17: Continue to maintain all installation wildlife crossing structures and identify locations in need of crossing structures.

- ***Objective***: Maintain these structures free of impediments to fish and wildlife movement and install new crossings where needed.
- ***Strategy***: Create Internal Job Orders (IJOs) and/or Service Orders for the maintenance and upkeep of wildlife crossing structures and coordinate the installation of new structures in current and future construction projects when practical.

Goal 18: Continue to evaluate the effectiveness of Fort Belvoir's existing nest box program.

- ***Objective***: Determine whether the program should be continued, modified, or terminated.
- ***Strategy***: Develop recommendations for volunteer projects to assume responsibility for nest box maintenance and data gathering.

Goal 19: Continue to evaluate and correct hazards to fish and wildlife.

- ***Objective***: Reduce and/or eliminate hazards to fish and wildlife.
- ***Strategy***: Remove/reduce fish and wildlife hazards where appropriate to include but not limited to electrocution hazards, fence hazards, window hazards, lighting, etc. Coordinate with Master Planning and Engineering Divisions of DPW, utility companies, and consult the Fort Belvoir Installation Design Guide.

Goal 20: Continue the Fort Belvoir hunting and fishing program.

- ***Objective***: Reduce and stabilize white-tailed deer population and maintain herd health.
- ***Objective***: Continue to provide access to consumptive recreation such as fishing, turkey hunting, and waterfowl hunting.
- ***Strategy***: Participate in the VDGIF DMAP program, perform biological/harvest data collection in support of the program, perform annual population census via spotlight survey, support VDGIF on herd health checks when appropriate, support Veterinarian Services in disease data collection, collect road kill data when practical, coordinate with VDGIF regarding other types of data collection as appropriate, set hunting season dates and harvest limits in coordination with VDGIF established season dates and harvest limits.
- ***Stategy***: Maintain management of the hunting and fishing programs using the iSportsman access software.

Goal 21: Continue feral cat control in accordance with DoD, DA, and Fort Belvoir policy.

- ***Objective***: Reduce and eliminate the release of feral cats into the wild.

- ***Strategy***: Removal of feral cats from the wild by the installation Pest Manager or Pest Managememt Contractor, prohibit the establishment and maintenance of feral cat colonies by any organization or individual.

Goal 22: Continue to support regional efforts to monitor and control wildlife diseases, as practical.

- ***Objective***: Control, reduce and/or minimize the outbreak and spread of wildlife diseases at the local, regional, and national level.
- ***Strategy***: Maintain the most current information and monitoring of diseases to include but not limited to West Nile Virus, Chronic Wasting Disease (CWD), Epizootic Hemorrhagic Disease (EHD), rabies, etc.

Goal 23 Continue to manage Mulligan Pond as fish habitat.

- ***Objective***: Maintain Mulligan pond as a healthy, sustainable native warm-water fishery and provide consumptive and non-consumptive recreational opportunities.
- ***Strategy***: Remove undesirable species, perform fish habitat improvements, control bank erosion, plant riparian vegetation, install habitat structures, and protect plantings from damage/loss to beavers. Consider programs for stocking.

Goal 24: Continue to reduce mowing, seasonally restrict mowing, and plant Native Warm Season Grass (NWSG) and wildflowers.

- ***Objective***: Promote pollinators and improve habitat for wildlife.
- ***Strategy***: Encourage the real property maintenance contractor and utility managers to reduce mowing and plant NWSG when applicable. Place restrictions on grassland and early-successional/scrub-shrub management activities during April-July to protect birds during the nesting season.

7.4.2 Actions

Actions are those activities that do not require ground breaking or environmentally altering activities. The following goals include Actions in their objectives and strategies:

Goal 25: Continue to coordinate with federal, state, and local agencies, and other entities, as appropriate, regarding fish and wildlife management.

- ***Objective***: Foster consistency in goals and management actions for fish and wildlife.
- ***Strategy***: Identify and coordinate with appropriate agencies and entities.

Goal 26: Continue to designate installation areas as open or closed to hunting, fishing and/or recreation in support of the military mission.

- ***Objective***: Specify area restrictions as needed for safety or resource protection considerations.

- ***Strategy***: Use current and former fish and wildlife surveys and data to specify area restrictions when applicable.

Goal 27: Continue to coordinate with USFWS under the Sikes Act and the Fish and Wildlife Coordination Act. Continue to coordinate with VDGIF under the Sikes Act, and state wildlife regulations.

- ***Objective***: Maintain compliance with state and federal laws and regulations.
- ***Strategy***: Maintain up-to-date policies and procedures regarding the management of fish and wildlife. Obtain and maintain all necessary fish and wildlife permits from state and federal agencies when applicable and perform all reporting requirements of these permits.

Goal 28: Continue to participate in regional and national level fish and wildlife conservation programs, such as PARC, PIF, and Chesapeake Bay Program.

- ***Objective***: Remain current on all policies, research, and development as they pertain to each program's area of expertise.
- ***Strategy***: Develop, maintain, and engage in communication with the programs as well as participate when applicable.

Goal 29: Continue to respond to requests for technical information from on-post and off-post entities, as appropriate.

- ***Objective***: Provide public access to natural resources information, as appropriate.
- ***Strategy***: Respond to requests for information, as appropriate.

Goal 30: Continue to manage natural resources information so it is accessible to, and usable by, installation natural resources managers

- ***Objective***: Develop and implement a fish and wildlife database
- ***Strategy***:
  1) Develop a system for storing data so that it is accessible for use.
  2) Enter electronic data.
  3) Scan and upload paper records.

Goal 31: Continue to issue installation-specific policies and guidance documents regarding conservation policies.

- ***Objective***: Provide direction and guidance for projects and mission activities that may impact fish and wildlife resources.
- ***Strategy***: Review and revise, as necessary, the *Fort Belvoir Conservation of Migratory Birds Policy* memorandum; the *Watercraft Recreation, Hunting and Fishing Policy* memorandum; the *Fort Belvoir Animal Control Regulation*; and the *Pet Control on Post Policy* memorandum, and any other documents, as needed.

Goal 32: Continue to enforce federal and state laws and regulations applicable to Fort Belvoir, as well as DoD, DA and Fort Belvoir natural resources policies.

- ***Objective***: Ensure Fort Belvoir remains in compliance with all applicable fish and wildlife laws and policies.
- ***Strategy***: Perform fish and wildlife compliance inspections. Perform inspections in support of enforcement actions.

Goal 33: Continue to provide technical assistance in emergency situations, such as injured wildlife.

- ***Objective***: Ensure emergencies are responded to while meeting regulatory requirements.
- ***Strategy***: Inspect, provide guidance, and provide assistance.

Goal 34: Continue an educational outreach program to highlight fish and wildlife management and conservation.

- ***Objective***: Increase the level of education and awareness for the on-post public.
- ***Strategy***:
  1) Develop field educational materials and/or field trips similar to a living classroom that can be used by schools and other large groups as appropriate, and to educate the general public.
  2) Write and publish articles on fish and wildlife
  3) Identify and provide opportunities for specialized training in conservation for garrison, partner, tenant and contractor personnel, as appropriate.
  4) Participate in educational and service events pertaining to fish and wildlife.

Goal 35: Continue as a responsible party in the DAAF Wildlife Working Group (WWG).

- ***Objective***: Maintain working relationship with DAAF WWG and meet all roles and responsibilities as defined by the DAAF WHMP.
- ***Strategy***: Attend semi-annual WWG meetings and retain open lines of communication with WWG.

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8.0 ENDANGERED, THREATENED AND RARE SPECIES

Within the U.S., federal land holdings such as DoD installations play a key role in the protection and restoration of declining species. The DoD has demonstrated that it is possible to manage its lands to support the military mission while promoting species protection/restoration. DoD's shift in focus in the 1990s toward ecosystem management provides greater protection for declining species. Leslie (1996), *Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers*, provides guidance and tools for natural resource managers on DoD installations to conserve ecosystems and rare species while maintaining military readiness.

Under the Endangered Species Act of 1973 (ESA), plant and animal species in danger of extinction throughout all or a significant part of their range are listed as endangered. Species that are likely to become endangered within the foreseeable future throughout all or a significant part of their range are listed as threatened. Endangered and threatened listings impart protective status to the listed species and their habitats. Additional designations under the ESA include proposed endangered and proposed threatened statuses, for species awaiting additional data to determine the need for listing. The ESA also includes candidate species, where the data support a species listing, but the listing procedure has been delayed. Additionally, the USFWS has a category for species under consideration for listing and species on the National Listing Workplan (NLW), and the Army maintains a listing of species considered at risk for listing ("Army Species at Risk" (ASAR)). While NLW and ASAR listings do not impart any legal protective status, they do require additional management considerations and resources to avoid emergency protection under the ESA.

In addition to federal protections, many states have endangered species legislation that provide protection status for threatened and endangered species vulnerable to extinction at the state level. Species that are protected under the federal ESA are also provided Endangered Species Act protection on the state level. States also have Natural Heritage Programs that maintain listings and rarity (i.e., conservation) rankings of rare plant and animal species, and ecological communities. Unlike endangered and threatened listings, rare species listings and their rankings are not legal designations, and do not provide any protective status. They are used to prioritize resources for conservation. Department of Conservation and Recreation Natural Heritage Program (DCR-NHP) rates individual species and communities with resource conservation rankings from S1 (extremely rare) to S5 (very common). Table 8-1 summarizes species that are potentially found on Fort Belvoir and their federal, state, NLW, and ASAR status.

Table 8-1: Species documented or potentially occurring on Fort Belvoir with federal, state protection or on the USFWS National Listing Workplan or identified by Army as Species at Risk for Listing					
Species	**Scientific Name**	**Federal**	**State**	**NLW**	**ASAR**
Small whorled pogonia	*Isotria medeoloides*	Threatened	Endangered		
Northern long-eared bat	*Myotis septentrionalis*	Threatened	Threatened		
Tricolored bat	*Perimyotis subflavis*		Endangered	X	
Little brown bat	*Myotis lucificus*		Endangered	X	
Peregrine falcon	*Falco peregrinus*		Threatened		
Wood turtle	*Glyptemys insculpta*		Threatened	X	
Spotted turtle	*Clemmys guttata*			X	
Northern Virginia well amphipod	*Stygobromus phreaticus*			X	X
Tidewater amphipod	*Stygobromus indentatus*			X	
Monarch butterfly	*Danaus plexippus*			X	
Rusty patched bumble bee	*Bombus affinis*	Endangered			
Atlantic Sturgeon	*Acipenser oxyrinchus*	Endangered	Endangered		

Source: U.S. Fish and Wildlife Service, 2018. Virginia Department of Game and Inland Fisheries, 2018

8.1 ENDANGERED, THREATENED, AND RARE SPECIES POLICIES

8.1.1 Federal Endangered, Threatened, and Rare Species Policies

- ***Endangered Species Act (16 USC §§ 1531-1543)***
  The Endangered Species Act of 1973 was enacted to protect plant and animal species considered to be in danger of extinction. The Act affords legal protection to species listed as endangered and threatened, including protection of their habitats. The USFWS makes the listings (as well as down-listings and de-listings) of endangered and threatened species on the basis of the species population, its biological vulnerability and threats to its survival. The USFWS also develops and implements recovery plans for listed endangered species. The Endangered Species Act establishes the federal government's responsibility for protection and recovery of species considered to be in danger of extinction. The act requires federal agencies to collaborate and undertake proactive actions to protect and restore populations of listed threatened and endangered species, and to prevent proposed and candidate species from being listed.

- ***The Fish and Wildlife Coordination Act (16 USC 661 et seq.)***
  This Act includes provisions for the protection of bald and golden eagles (Chapter 5A, subchapter II) and endangered species of fish and wildlife (Chapter 5A, subchapter III).

- ***The Sikes Act (16 USC Section 670a, et seq.) as amended in the Sikes Act Improvement Act of 1997***
  This act directly requires conservation and management of fish and wildlife on DoD installations. The Sikes Act authorizes the Secretary of Defense to (1) carry out a program for the conservation and rehabilitation of natural resources on military installations, and (2) prepare an INRMP in cooperation with the USFWS and state fish and wildlife agencies. The Sikes Act requires the INRMP to reflect the mutual agreement of the parties [USFWS and state fish and wildlife agencies] concerning conservation, protection, and management of fish and wildlife resources.

8.1.2 State Endangered, Threatened, and Rare Species Policies

The Commonwealth of Virginia has two state endangered species acts that were enacted to protect plant and animal species from extinction at the state level. These acts are used for guidance when addressing mitigation and stewardship so as not to further imperil those species listed at the state level. Species listed at the state level have the potential to become federally listed thus affecting mission.

- ***Code of Virginia, § 29.1***
  This Act, administered by the Virginia Department of Game and Inland Fisheries (VDGIF), addresses fish and wildlife, excluding insects.
- ***Code of Virginia, §§ 3.1***
  This Act, administered by the Virginia Department of Agriculture and Consumer Services (VDACS) addresses plants and insects.

8.1.3 Department of Defense Endangered, Threatened, and Rare Species Policy

- ***Natural Resources Conservation Program (DoDI 4715.03)***
  DoD's natural resources management policy and instruction requires installations to follow an ecosystem-based approach to natural resources management using adaptive management of natural resources, to inventory and protect important biological resources, and to promote biodiversity, while being able to provide continued access to installation air, water and land for realistic military training and testing. The instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education, and scientific research and study, compatible with the installation's ecosystem management goals and military mission. The instruction also instructs installations, to the best of their ability, implement conservation and management efforts to further the conservation of federal endangered and threatened species, as well as State endangered and threatened species when such action is practicable and does not conflict with military mission or capabilities.

8.1.4 Department of the Army Endangered, Threatened, and Rare Species Policy

- ***Environmental Protection and Enhancement (AR 200-1)***
  This regulation covers environmental protection and enhancement and provides the framework for the Army Environmental Management System.

AR 200-1 implements Federal, State, and local environmental laws and DoD policies for preserving, protecting, conserving, and restoring the quality of the environment. AR 200-1 also establishes the Army's commitment to carry out mission and program requirements that are consistent with the requirements of the Endangered Species Act, be sensitive to those species listed as endangered or threatened under state law, and prepare endangered species management plans for listed and proposed species. Excerpts from AR 200-1, follow.

Excerpts from AR 200-1 as Applicable to Endangered, Threatened, and Rare Species

- Planning level surveys must include a survey that maps and shows occurrence, habitat distribution, and habitat management areas of federally endangered, threatened, proposed, candidate, and species at risk occurring on the installation.
- Prepare and implement an Endangered Species Management Component (ESMC) to the INRMP consistent with current policy and guidance.
- 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.
- In accordance with ACSIM guidance, take appropriate actions to preclude critical habitat designation.
- Assess all activities (to include Military Construction (MILCON)) at the earliest opportunity to determine whether they may affect listed species or critical habitat.
- Coordinate threatened and endangered species actions or issues with ACOM, ASCC, and DRU commanders and other tenants that may be affected by them.
- Conduct biological assessments for activities that may have an effect on listed species or critical habitat where they are present or may be present in the action area.
- Informally or formally consult with the USFWS or NOAA-Fisheries and document results in writing, and conduct a biological assessment or evaluation to assess whether an action may affect a listed species or critical habitat.
- Confer with the USFWS and NOAA-Fisheries on any action that is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat.
- Participate in listing/delisting process, recovery plan, and critical habitat designation where the species in question may impact installation military missions.

- In accordance with ACSIM guidance, manage species at risk and habitats to prevent listing that could affect military readiness.
- Implement management plans for species at risk to include, but not limited to, surveying, monitoring, habitat enhancement, and protection.

8.1.5 Fort Belvoir Endangered, Threatened, and Rare Species Policy

Fort Belvoir does not have an over-arching endangered, threatened and rare species policy other than the policy specified in this INRMP. Fort Belvoir has a *Memorandum of Instruction – Northern Long-eared Bat Protection on Fort Belvoir*. (Appendix _L)

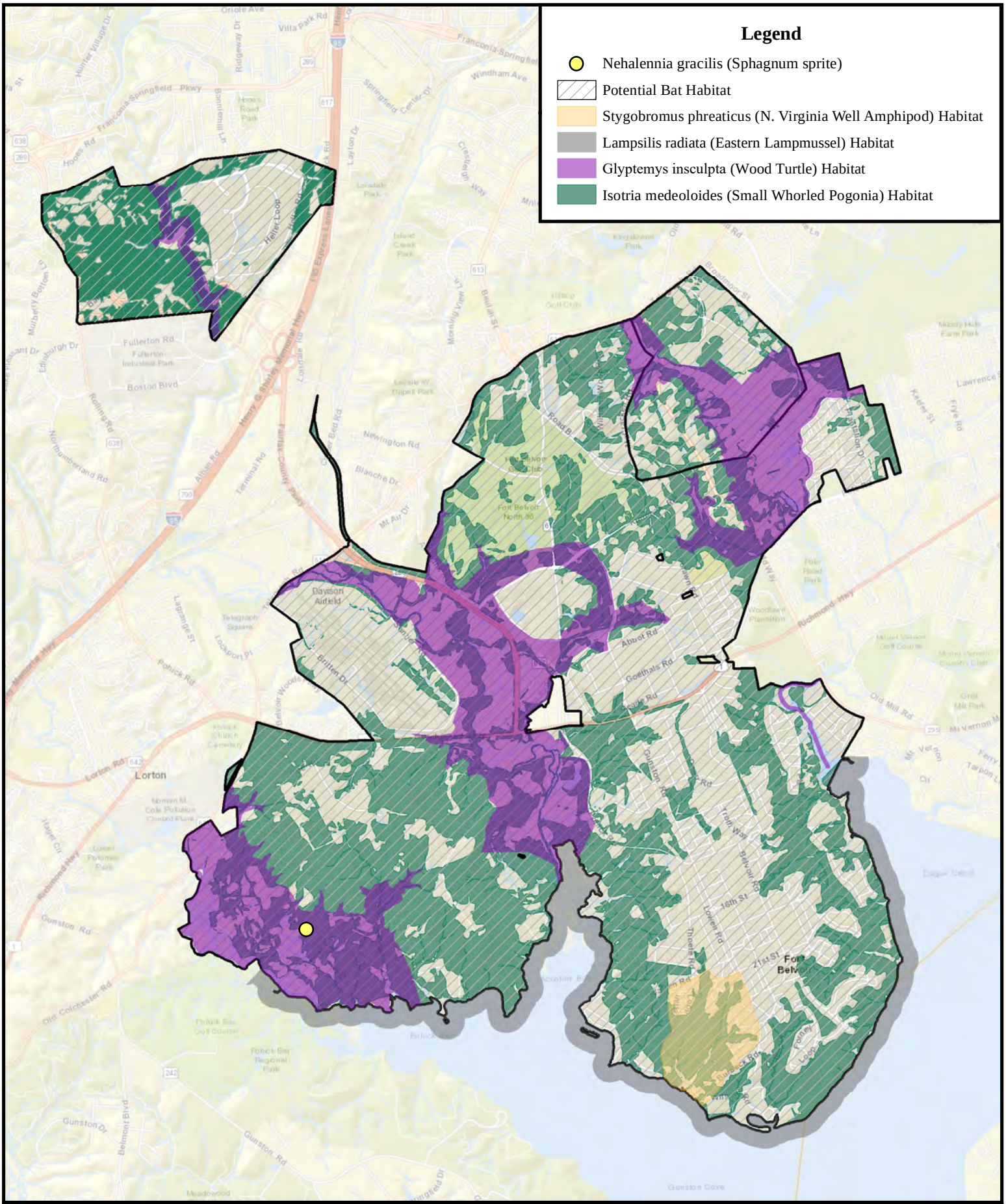
8.2 ENDANGERED, THREATENED, AND RARE SPECIES MANAGEMENT

The foundation of Fort Belvoir's endangered, threatened and rare species management is habitat conservation, consistent with the conservation recommendations of DCR-NHP (McCoy and Fleming, 2000; Hobson, 1996; 1997, 2013). Much of the installation's habitat for federal threatened species and state threatened or endangered species, as well as the rare wetland community types, and their associated rare plant and animal species, are contained within the designated "Special Natural Areas" (Section 9). The Fort Belvoir RPMP designates these areas (the three installation refuges and the two installation corridors) as well as wetlands and steep-sloped areas outside the boundaries of the Special Natural Areas, as environmentally constrained areas. Such conservation land-use designations protect the habitat in these areas from loss to development or land disturbing training activities.

Fort Belvoir also addresses conservation and enhancement of native biodiversity within ecological communities by identifying and controlling threats from invasive/exotic species and from stormwater-related problems (Sections 6 and 5, respectively).

Information on endangered, threatened, and rare plant and animal species, and rare ecological communities of Fort Belvoir has been obtained through various surveys. The results of these surveys have been incorporated into the installation GIS (Figure 8.1).

In 1996-1997, and in 2011-2013 DCR-NHP completed multi-year natural heritage inventory surveys (Hobson, 1996; 1997, 2013) (Appendix K). The purpose of these inventories was to systematically identify the installation's natural heritage resources: those sites supporting unique or exemplary natural



ENDANGERED, THREATENED, AND RARE SPECIES HABITAT ON FORT BELVOIR

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Figure 8.1

Source: Fort Belvoir GIS, Google road maps

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communities, rare plants and rare animals, and other significant natural areas. The natural heritage inventories identified three installation areas with significant biodiversity, all of which included wetlands: (1) the Pohick Creek-Pohick Bay-lower Accotink Creek-Accotink Bay wetland complex; (2) the upper Dogue Creek wetland complex; and (3) the T-17 ravine seeps (Appendix K).

Conservation of rare plant and animal species and their habitats were important considerations in the establishment/expansion of three of the Special Natural Area designations: ABWR, Jackson Miles Abbott Wildlife Refuge (JMAWR), and the T-17 Refuge (Section 9). Special Natural Area designation of these areas has effectively protected a large amount of the installation's habitat for federal threatened and state threatened and endangered species, and rare wetland communities and associated rare plant and animal species, from loss to development or land disturbing training activities.

In 2000, DCR-NHP completed an ecological communities assessment of Fort Belvoir Main Post (McCoy and Fleming, 2000). This assessment was undertaken as an expansion and follow-on to the 1996-1997 DCR-NHP natural heritage inventory. The purpose of the ecological communities assessment was to develop an ecological-based definition and description of the ecological communities on post, consistent with The Nature Conservancy's National Vegetation Classification system. The ecological communities assessment defined and described the communities in greater detail than was done in the previous natural heritage inventory, and addressed plant relationships with site environmental conditions (e.g., hydrology, soil chemistry). The ecological communities assessment confirmed the high biodiversity of the Fort Belvoir wetland communities, as previously reported by the natural heritage inventory, and assigned these communities a high priority for conservation.

8.2.1 Small Whorled Pogonia

The small whorled pogonia is a federal threatened and state endangered forest dwelling orchid that has been identified previously at FBNA. The status of the small whorled pogonia on Fort Belvoir is currently unknown because of its unusual life-cycle of up to five year dormancy periods. Surveys have been conducted within selected areas, but have not yielded any additional colonies elsewhere on Fort Belvoir. These surveys, done in support of land planning, have identified areas of high-quality and medium-quality small whorled pogonia habitat. This information has been included in the installation GIS. Potential threats to the small whorled pogonia include destruction of habitat, herbicide use, and consumption by herbivores.

8.2.1.1 Small Whorled Pogonia Management and Conservation Strategies

- Implement land use restrictions around known colonies to avoid earth moving activities and habitat/ecosystem impacts that might impact colonies.
- Continue to use the NEPA process to evaluate, provide alternatives and if possible eliminate risks.
- Consult with the USFWS if potential impacts occur, may occur or are unavoidable.
- Avoid use of herbicide around known colonies. If herbicide may have to be used for control of invasive exotic species that are a threat to the colony, then consultation with the USFWS is required to address the issues.
- Placement of protective structures to protect the plant from predation.
- Perform a small whorled pogonia survey if Fort Belvoir staff or the USFWS identify small whorled pogonia during the NEPA or project review process.
- Small whorled pogonia surveys may be required as a project cost if a project may impact "high quality habitat" elsewhere on Fort Belvoir or as a requirement for other permits.

8.2.2 Northern Long-Eared Bat

The northern long-eared bat is a federal threatened and state threatened forest dwelling bat that historically used to be a common species in Virginia and that has been identified on Fort Belvoir. The devastating effects of White-Nose Syndrome caused by the fungus (*Pseudogymnoascus destructans*) created the need for federal and state protection. Fort Belvoir has been conducting mist net surveys and using acoustics devices since 1998 to monitor bat populations on Fort Belvoir property.

Potential threats to the northern long-eared bat are disease, habitat destruction (roost, foraging, reproduction, and hibernacula impacts), bioaccumulation of pesticides, and predation.

8.2.2.1 Northern Long-eared Bat Management and Conservation Strategies

- Continue to manage Fort Belvoir's mission activities, construction, development, and natural resources in accordance with the Informal Conference & Management Guidelines on the Northern Long-eared Bat for Ongoing Operations on Installation Management Command Installations (Appendix L) and the USFWS intra-Service Programmatic Biological Opinion on the final 4(d) rule until an updated programmatic consultation can be approved that provides coverage for Fort Belvoir.

- Follow *Memorandum of Instruction – Northern Long-eared Bat Protection on Fort Belvoir*, addressing the time of year restriction for tree removal of April 15 – September 15 (Appendix L).
- Manage pesticide use and application as addressed in the informal conference.
- Consult with USFWS if activities cannot be conducted under the guidelines established in the informal conference.
- Continue with installation wide acoustic, mist netting surveys and use of radio telemetry for determination of year round use (roosts, maternity, migration, swarming, and hibernation).
- Perform a bat survey if a project is not able to adhere to the management guidelines set in the informal conference.
- Perform bat surveys if it is a condition of other federal or state permits or if the protective status of the species changes such as threatened to endangered.
- Continue to use the NEPA process to evaluate, provide alternatives and if possible eliminate risks.

8.2.3 Tricolored Bat

The tricolored bat is state endangered and has also been added to the National Listing Workplan. The tricolored bat is still frequently documented foraging and roosting on Fort Belvoir. The devastating effects of White-Nose Syndrome created the need for state protection and petition for federal protection. Fort Belvoir has been conducting mist net surveys and using acoustics devices since 1998 to monitor bat populations on Fort Belvoir property.

Potential threats to the tricolored bat are disease, habitat destruction (roost, foraging, reproduction, and hibernacula impacts), bioaccumulation of pesticides, and predation.

8.2.3.1 Tricolored Bat Management and Conservation Strategies

The management and conservation strategies established under the northern long-eared bat informal conference and Fort Belvoir's *Memorandum of Instruction – Northern Long-eared Bat Protection on Fort Belvoir*, will also provide applicable guidelines to protect and conserve the tricolored bat.

8.2.4 Little Brown Bat

The little brown bat is state endangered and has also been added to the National Listing Workplan. The little brown bat used to be a common species documented at Fort Belvoir prior to the devastating effects of White-Nose Syndrome. Fort Belvoir has been conducting mist net surveys and using acoustics devices since 1998 to monitor bat populations on Fort Belvoir property.

Potential threats to the little brown bat are disease, habitat destruction (roost, foraging, reproduction, and hibernacula impacts), bioaccumulation of pesticides, and predation.

8.2.4.1 Little Brown Bat Management and Conservation Strategies

The management and conservation strategies established under the northern long-eared bat informal conference and Fort Belvoir's *Memorandum of Instruction – Northern Long-eared Bat on Fort Belvoir*, will also provide applicable guidelines to protect and conserve the little brown bat.

8.2.5 Peregrine Falcon

The peregrine falcon is a state threatened species. The peregrine falcon occurs occasionally along Fort Belvoir's shoreline.

Potential threats to the peregrine falcon foraging habitat include disturbances near the shoreline, shoreline development, and recreational activities on waters surrounding Fort Belvoir.

8.2.5.1 Peregrine Falcon Management and Conservation Strategies

No management strategies are in place specifically for the Peregrine falcon. Bald eagle management strategies will provide protection of the foraging areas along the Fort Belvoir shoreline (Figure 7.4).

8.2.6 Wood Turtle

The wood turtle is a state threatened species and has also been added to the National Listing Workplan. The wood turtle has been documented on Fort Belvoir in several locations. The wood turtle is found primarily in mesic deciduous woodlands in and near clear creeks in Fairfax County (Ernst et al., 1997a). The wood turtle is very mobile and is a highly terrestrial species that typically uses creeks for hibernacula and mating and uses the riparian zones around the creeks during its more terrestrial stages.

Wood turtle habitat surveys, done throughout the installation, have identified areas of high-quality, medium-quality and low-quality wood turtle habitat. This information has been incorporated into the installation GIS. Ongoing turtle projects that utilize radio telemetry to track turtle usage of the landscape on Fort Belvoir will incorporate Wood turtles into the project if any are located.

Potential threats to the wood turtle include development of the riparian buffers, increased storm water flow, and poaching of turtles for the pet trade.

8.2.6.1 Wood Turtle Management and Conservation Strategies

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks.
- Continue to manage and protect riparian zones.
- Continue protections in place for water quality within the industrial storm water permit program and MS4 permit program.
- Perform a wood turtle survey for projects that are located in identified aquatic or terrestrial habitats.
- Perform a wood turtle survey if one is a condition of federal permits.
- Provide turtle education information or educational training to project sites that are within or in close proximity to wood turtle habitat.
- Continue winter/spring aquatic surveys.
- Continue late spring/summer terrestrial surveys.

8.2.7 Spotted Turtle

The spotted turtle (*Clemmys guttata*) is a turtle common to Fort Belvoir that has been recently added to the National Listing Workplan to evaluate the species' needs for federal protection. The turtle is found primarily in the flooded forested wetlands but will travel across the Fort Belvoir landscape from wetland to wetland. An ongoing spotted turtle project has recaptured marked spotted turtles that were originally marked in 1989 and also turtles marked in 2002. Radio telemetry units have been placed on some spotted turtles to identify the species' usage of the Fort Belvoir landscape.

Potential threats to the spotted turtle include development within the riparian buffers around the wetlands, alterations to wetland hydrology, and poaching of turtles for the pet trade.

8.2.7.1 Spotted Turtle Management and Conservation Strategies

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks.
- Perform a spotted turtle survey if one is a condition of federal permits for actions within or adjacent to wetlands.
- Continue to manage and protect wetlands and riparian zones.
- Continue protections in place for water quality within the industrial storm water permit program and MS4 permit program.
- Provide turtle education information or educational training to project sites that are within or in close proximity to spotted turtle habitat.
- Continue multi-year spotted turtle population and landscape usage-based surveys.

8.2.8 Northern Virginia Well Amphipod

The northern Virginia well amphipod (*Stygobromus phreaticus*), a groundwater dwelling species, was first discovered in a seep within a T-17 ravine during surveys at Fort Belvoir conducted by DCR-NHP in 1996. This was the first known sighting of the amphipod since its collection from wells in Vienna, Virginia, in 1941, and Alexandria, Virginia, in 1948 (Hobson, 1997). Little is known about the amphipod; it is not state or federally listed but does have an ASAR designation and has been added to the National Listing Workplan for evaluation to determine the species' needs for federal protection. Surveys for *Stygobromus* species have been conducted since the discovery of *Stygobromus phreaticus* in 1996 to identify other populations or locations that the species can be surveyed. Presently the species is only known from one location on Fort Belvoir. A "Special Natural Area" designation (as the T-17 refuge) was made in accordance with DoDI 4715.03 to afford the seep area special conservation status on post. This designation was done as a NEPA mitigation commitment for BRAC 2005 (Section 9).

Potential threats to the northern Virginia well amphipod include a sensitivity to groundwater contamination, pollution, impacts to the recharge zones of the water table as well as groundwater withdrawal, and disruption of slope stability.

8.2.8.1 Northern Virginia Well Amphipod Management and Conservation Strategies

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks.
- Continue to maintain Special Natural Area designation of the T-17 Refuge to provide a buffer around the seep and restrict activities in the landscape surrounding the seep.
- Protect the recharge zones for the aquifer by limiting an increase in impervious surface within 0.5 mile of the seep if mission allows.
- Continue to address the 21st street solid waste transfer facility under the industrial storm water permit program (VPDES –Industrial Stormwater Major Permit VA0092771 Part 1 A.7) and continue testing storm water samples leaving the facility and entering the drainage in accordance with the permit requirements. Analytic results from water testing under the installation stormwater permits, and responses to any exceedances, will be coordinated with the USFWS annually.
- Continue to manage the 21st street solid waste transfer facility under the MS4 permit program (VAR040093) to regulate the quantity and condition of the storm water in accordance with the permit requirements as well as sediment and erosion control measures. Analytic results from water testing under the installation stormwater

permits, and responses to any exceedances, will be coordinated with the USFWS annually.

- Monitor other seeps around Fort Belvoir as new seeps are identified or there are potential risks to currently known seeps that are not known to have *S. phreaticus* to be able to identify if any additional locations or populations can be located. The known seep will be visited and visually inspected on a periodic basis (quarterly and after heavy rain events) to ensure that the habitat has not been impacted by installation operations. If impact is observed, response will be coordinated with USFWS.
- Continue to monitor the condition of the wells that are surrounding the T-17 seep and used to monitor water quality of the aquifers.

8.2.9 Tidewater Amphipod

The Tidewater amphipod (*Stygobromus indentatus)* is a species that has been documented on Fort Belvoir. The species is similar to the northern Virginia well amphipod in that it lives in the underground aquifers and can typically only be encountered in a few seeps around Fort Belvoir. The species has been added to the National Listing Workplan. Currently ongoing surveys for *Stygobromus phreaticus* have allowed us to identify populations and locations of the *Stygobromus indentatus*.

Potential threats to the Tidewater amphipod include a sensitivity to groundwater contamination, pollution, impacts to the recharge zones of the water table as well as groundwater withdrawal.

8.2.9.1 Tidewater Amphipod Management and Conservation Strategies

- Continue to monitor and survey the seeps on Fort Belvoir for additional locations where the species can be identified.
- Continue to use the NEPA process to evaluate, provide alternatives and if possible eliminate risks.
- Attempt to minimize the addition of impervious surfaces within the recharge zones of the underground water table, through the NEPA project review process.

8.2.10 Monarch Butterfly

The monarch butterfly *(Danaus plexippus)* is one of several native pollinators that occur on Fort Belvoir and have seen a decrease in populations across the region. The monarch is currently on the National Listing Workplan and all management strategies are voluntary. The monarch butterfly relies heavily upon milkweed plants for early life stages. When stands of milkweed are identified, attempts are

made to protect those stands from herbicide and/or mowing if applicable and do not affect the military mission.

Potential threats to the monarch butterfly are loss of habitat and host plant species, insecticide usage, herbicide usage, disease, and predation.

8.2.10.1 Monarch Butterfly Management and Conservation Strategies.

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks.
- Continue to survey for and monitor native pollinators.
- Incorporate and maintain natural landscaping designs into appropriate areas.
- Adhere to the guidelines for insecticide use as described in the Integrated Pest Management Plan (Appendix D).
- Adhere to the guidelines for herbicide use as described in the Integrated Pest Management Plan (Appendix D).
- Avoid mowing of natural landscapes during the growing season unless it is part of non-native species management and then avoid mowing milkweed, if possible.
- Continue to monitor and track milkweed populations.

8.2.11 Rusty Patched Bumble Bee

The rusty patched bumble bee (*Bombus affinis)* is a federally endangered species that has not been located on Fort Belvoir but could be located on Fort Belvoir or in close proximity. No official surveys specifically for the rusty patched bumble bee have been conducted, however other pollinators surveys have been conducted. The species is being included in this section to incorporate some strategies that will benefit the species. In addition it will benefit from management and conservation strategies for the monarch butterfly.

Potential threats to the species include loss of habitat, insecticide use, herbicide use, and disease.

8.2.11.1 Rusty Patched Bumble Bee Management and Conservation Strategies

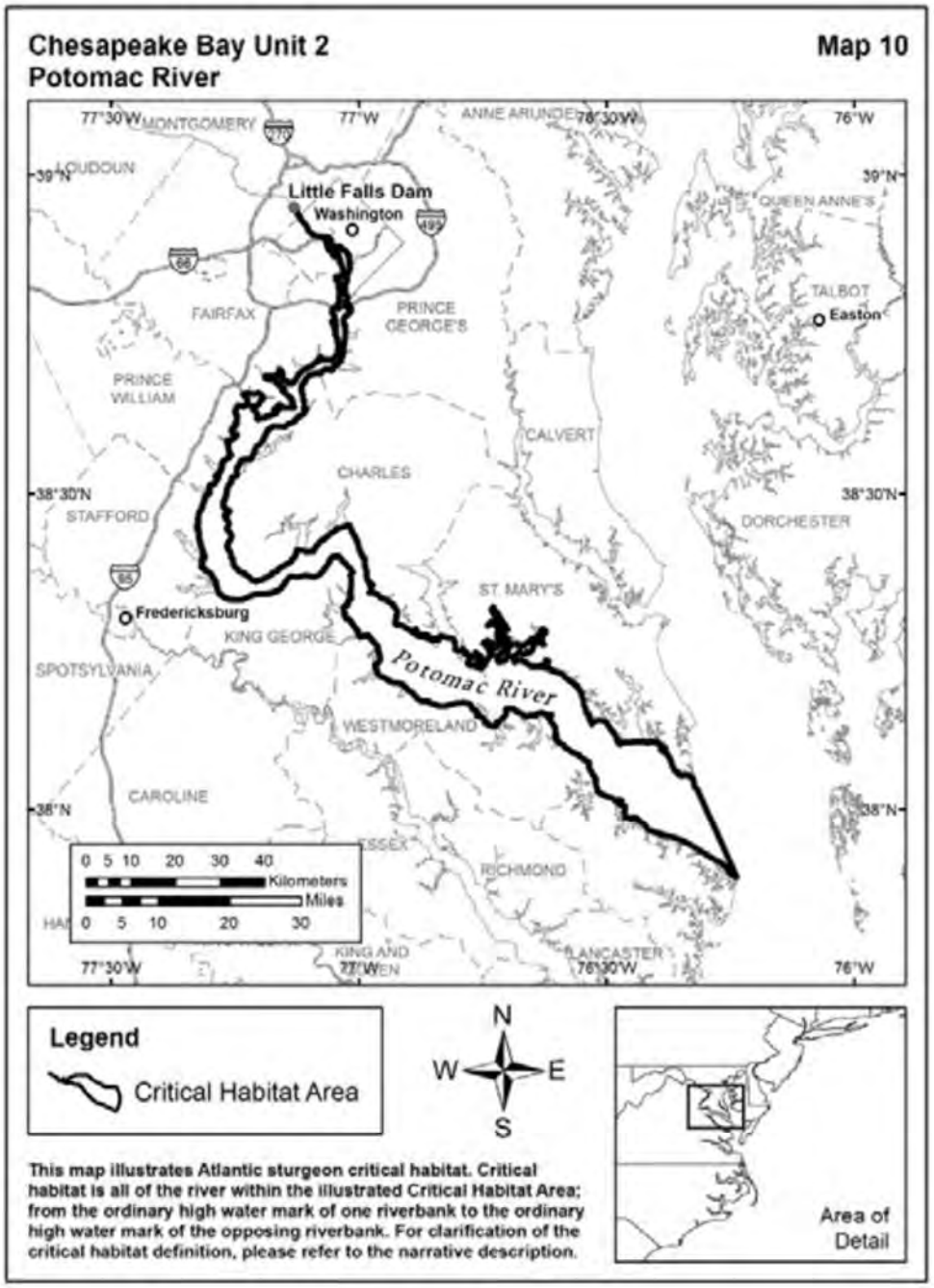
- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks.
- Continue to survey for rusty patched bumble bee and monitor native pollinators.
- Incorporate and maintain natural landscaping designs into appropriate areas.

- Adhere to the guidelines for insecticide use as described in the Integrated Pest Management Plan (Appendix D).
- Adhere to the guidelines for herbicide use as described in the Integrated Pest Management Plan (Appendix D).

8.2.12 Atlantic Sturgeon

The Atlantic sturgeon (*Acipenser oxyrinchus)* is a federal endangered and state endangered anadromous fish species that has been documented in the Potomac River near Fort Belvoir. In 2017 critical habitat was designated for the Chesapeake Bay Distinct Population Segments to include the Potomac River and some of its bays and tributaries (Figure 8.2).

Figure 8.2: Designated Habitat for the Atlantic Sturgeon



Potential threats to the Atlantic sturgeon include bycatch of sturgeon in fisheries targeting other species, pollution, excessive loud noise (in water bridge or pier construction), increases in sedimentation, degradation of habitat from human activities, loss of habitat, and loss of access to spawning grounds. Given Fort Belvoir's location in the Chesapeake Bay drainage area, activities that may impact the sturgeon are heavily regulated and permitted. Additional information on these factors are covered in greater detail in Section 5 Water Resources.

8.2.12.1 Atlantic Sturgeon Management and Conservation Strategies

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks.
- Continue protections in place for water quality within the industrial storm water permit program and the MS4 permit program.
- Protect and minimize impacts within the 750 foot Bald Eagle foraging buffer zone along Fort Belvoir's shoreline.
- Continue to manage and protect riparian zones.
- Continue to be compliant with wetland permit protections.
- Continue implementing BMP's for sediment and erosion control measures.
- Continue to protect a 100 foot RPA buffer along perennial streams.
- Continue to protect a 35 foot buffer along intermittent streams.
- Continue restoration and stabilization of shorelines and stream channels.
- Continue to adhere to a time of year restriction on bodies of water that could impact anadromous fish as designated in our wetland permits.
- Provide educational materials to the fishing community.
- Continue to follow guidance as set in the Nutrient Management Plan.
- Continue to follow the guidance as set in the Integrated Pest Management Plan (IPMP) for herbicide and pesticides (Appendix D).
- Consult with NMFS under section 7 of the ESA for any activities that may impact sturgeon or designated critical habitat for the Atlantic sturgeon.
- Participate in regional sturgeon monitoring efforts.

8.2.13 Rare Species

The result of the various surveys indicate that Fort Belvoir possesses a large number of rare plant and animal species, and rare ecological communities. Unlike threatened and endangered listings, rare species rankings by themselves do not provide any legal protective status. Rare species remain a focal point for conservation so that species populations can remain stable and avoid the need for any additional federal or state protection. The results of the 2011-2013 DCR-NHP survey identified previously unknown populations of the Osmunda borer

moth (*Papaipema speiosissima*) that allowed the state to adjust the rankings from rare to uncommon. Fort Belvoir uses information from the DCR-NHP to inform natural resources stewardship actions on post.

Eighty-six plant and animal species with state rarity/conservation rankings of either S3 (rare to uncommon), S2 (very rare), or S1 (extremely rare) have been identified as occurring on Fort Belvoir (Table 8-2). The list of rare animal species provided in the Natural Heritage Inventory reports (Hobson, 1996; 1997, 2013) does not contain the complete list of rare animals that occur on Fort Belvoir. This is mainly because the inventory surveyed areas that were determined to have high potential for rare species or exemplary vegetation communities rather than surveying throughout the post. In addition, the Virginia rare animal species list is a living list that is updated annually. This necessitates regular cross-referencing with species documented on the installation. Table 8.2 presents a comprehensive listing of all birds, mammals, reptiles, and amphibians that have been documented as occurring on post and that have been designated as a Virginia state-rare species with a state rarity rank of either S1, S2, or S3 or a watch list species. Information on rare species has been incorporated into the installation GIS.

Table 8-2: Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir				
Scientific Name	***Common Name***	***Taxon***	***Virginia Status****	***DCR-NHP Status***
Lasionycteris noctivagans	Silver-haired bat	Mammal		SUB/S4N
Lasiurus cinerus	Hoary bat	Mammal		SUB/S4N
Myotis leibii	Eastern small-footed bat	Mammal		S2
Myotis lucifugus	Little brown bat	Mammal	LE	S1S3
Myotis septentrionalis	Northern long-eared bat	Mammal	LT	S1S3
Perimyotis subflavus	Tricolored bat	Mammal	LE	S1S3
Accipiter cooperi	Cooper's hawk	Bird		S3B/S2
Actitis macularia	Spotted sandpiper	Bird		S1B
Aegolius acadicus	Northern saw-whet owl	Bird		S1B/S2N
Anas discors	Blue-winged teal	Bird		S1B/S2N
Anas strepera	Gadwall	Bird		S2B/S4N
Aquila chrysaetos	Golden eagle	Bird		SHB/S1N
Ardea alba	Great egret	Bird		S2S3B/S3N
Ardea herodias	Great blue heron	Bird		S3B/S5N
Asio flammeus	Short-eared owl	Bird		S1B/S2N
Asio otus	Long-eared owl	Bird		S1
Bartramia longicauda	Upland sandpiper	Bird	LT	SHB
Botaurus lentiginosus	American bittern	Bird		S1B/S2N
Haemorhous purpureus	Purple finch	Bird		S1B/S5N
Catharus guttatus	Hermit thrush	Bird		S1B/S5N
Catharus ustulata	Swainson's thrush	Bird		S1B
Certhia familiaris	Brown creeper	Bird		S3B/S5N
Circus cyaneus	Northern Harrier	Bird		S1S2B/S3N
Cistothorus platensis	Sedge wren	Bird		S1B/S1S2N
Contopus borealis	Olive-sided flycatcher	Bird		SHB
Setophaga magnolia	Magnolia warbler	Bird		S2B
Dolichonyx oryzivorus	Bobolink	Bird		S1B
Egretta caerulea	Little blue heron	Bird		S2B/S3N
Egretta thula	Snowy egret	Bird		S2B/S3N
Empidonax alnorum	Alder flycatcher	Bird		S1S2B

Table 8-2: Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir				
Scientific Name	***Common Name***	***Taxon***	***Virginia Status****	***DCR-NHP Status***
Empidonax flaviventris	Yellow-bellied flycatcher	Bird		S1B
Falco perigrinus	Peregrine falcon	Bird	LE	S1B/S2N
Fulica americana	American coot	Bird		S1B/S5N
Haliaeetus leucocephalus	Bald eagle	Bird	LE	S3S4B/S3S4N
Ixobrychus exilis	Least bittern	Bird		S3B/S3N
Lanius ludovicianus	Loggerhead shrike	Bird	LT	S1B/S2N
Loxia curvirostra	Red crossbill	Bird		S1
Melospiza georgiana	Swamp sparrow	Bird		S1B/S4S5N
Mergus merganser	Common merganser	Bird		S1B/S4N
Nycticorax nycticorax	Black-crowned night heron	Bird		S3B/S4N
Nycticorax violacea	Yellow crowned night heron	Bird		S2S3B/S3N
Oporonis philadelphia	Mourning warbler	Bird		S1B
Petrochelidon pyrrhonota	Cliff swallow	Bird		S3S4B
Plegadis falcinellus	Glossy ibis	Bird		S2B/S1N
Podilymbus podiceps	Pied-billed grebe	Bird		S1S2B/S4N
Porzana carolina	Sora	Bird		S1B/S2N
Rallus elegans	King rail	Bird		S2B/S3N
Rallus limicola	Virginia rail	Bird		S2B/S3N
Regulus calendula	Golden-crowned kinglet	Bird		S2B/S5N
Riparia riparia	Bank swallow	Bird		S3B
Parkesia noveboracensis	Northern waterthrush	Bird		S1B
Sitta candensis	Red-breasted nuthatch	Bird		S2B/S4N
Sphyrapicus varius	Yellow-bellied sapsucker	Bird		S1B/S4N
Sterna antillarum	Least tern	Bird		S2B
Sterna caspia	Caspian tern	Bird		S1B/S2N
Sterna forsteri	Forster's tern	Bird		S3B/S3N
Sterna hirundo	Common tern	Bird		S3B
Troglodytes troglodytes	Winter wren	Bird		S2B/S4N
Vermivora chrysoptera	Golden-winged warbler	Bird		S3B
Vermivora ruficapilla	Nashville warbler	Bird		S1B

Table 8-2: Commonwealth of Virginia and Natural Heritage Ranked Species That Have Been Identified on Fort Belvoir				
Scientific Name	***Common Name***	***Taxon***	***Virginia Status****	***DCR-NHP Status***
Glyptemys insculpta	Wood turtle	Reptile	LT	S2
Stygobromus tenuis	Potomac amphipod	Crustacean		S3
Stygobromus phreaticus	Northern Virginia well amphipod	Crustacean		S1
Lampetra aepyptera	Least brook lamprey	Fish		S3
Ischnura prognata	Furtive forktail	Insect		S3
Nehalennia gracilis	Sphagnum sprite	Insect		S2
Lampsilis radiata	Eastern lampmussel	Mollusk		S2S3
Leptodea ochracea	Tidewater mucket	Mollusk		S3
Moehringia lateriflora	Grove Sandwort	Plant		S1
Sceptridium oneidense	Blunt-lobed grape fern	Plant		S1
Calamovilfa brevipilis	Pine barrens reedgrass	Plant		S1
Carex vestita	Velvety sedge	Plant		S2
Eleocharis equisetoides	Horsetail spike-rush	Plant		S1
Iris versicolor	Larger blue flag	Plant		S3
Lathyrus palustris	Marsh pea	Plant		S1
Ranunculus ambigens	Water plantain crowfoot	Plant		S1
Bolboschoenus fluviatilis	River bulrush	Plant		S2
Sparganium eurycarpum	Giant bur-reed	Plant		S3
Cordulegaster erronea	Tiger spiketail	Insect		Watchlist
Danaus plexippus plexippus	Monarch	Insect		Watchlist
Lasionyccteris noctivagans	Silver-haired bat	Mammal		Watchlist
Lasiurus cinereus	Hoary bat	Mammal		Watchlist
Ligumia nasuta	Eastern pondmussel	Mollusk		Watchlist
Strophitus undulatus	Creeper	Mollusk		Watchlist
Stygobromus indentatus	Tidewater amphipod	Crustacean		Watchlist
Eleocharis smallii	Creeping spikerush	Plant		Watchlist

***Sources**: Bird identification information from Fleming, 2000; Mammal identification information from Fort Belvoir files; Reptile identification information from Fort Belvoir files; Crustacean information from Hobson, 1996 and 1997, 2013; Insect information from Hobson, 1996 and 1997, 2013; Mollusk information from Hobson, 1996 and 1997, 2013; Plant information from Wells, 1999 and Hobson, 1996 and 1997. All species status information was updated according to Roble, 1999 and Killeffer, 2000.*

Virginia Status Listings:*

LE: Listed Endangered
LT: Listed Threatened

Natural Heritage Rankings:
S1: Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.
S2: Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.
S3: Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
SH: Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.
SU: Status uncertain, often because of low search effort or cryptic nature of the element.
S_B, S_N: Breeding and nonbreeding status of an animal in Virginia, when they differ.
?: Indicates an uncertain ranking.

8.2.13.1 Rare Species Management and Conservation Strategies

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks to rare species.
- Continue protections in place for water quality within the industrial storm water program and the MS4 permit program.
- Continue to conduct installation-wide surveys for threatened, endangered, and rare species.
- Many of the threatened and endangered species protection strategies will provide coverage to most of the rare species given the shared habitats.

8.2.13.2 Rare Ecological Communities

The ecological communities assessment (McCoy and Fleming, 2000) identified 17 community types on Fort Belvoir Main Post, four of which are ranked very rare or extremely rare, and three of which are ranked as rare to uncommon (Note, S1 = extremely rare; S2 = very rare and S3 = rare to uncommon; G = global; ? = Indicates an uncertain ranking). These communities are presented in Figure 9.2. DCR-NHP has delineated the boundaries of three areas on Fort Belvoir to encompass all of the rare plant species and rare ecological communities, and most of the rare animal species. DCR-NHP ranked one of these areas as B1 (outstanding significance), one as B3 (high significance) and one as B5 (general biodiversity significance) (Hobson, 1996; 1997; McCoy and Fleming, 2000) Figure 6.6, Figure 9.2, Appendix K).

- Coastal Plain/Piedmont Acidic Seepage Swamp - G2, G3, S2
- Tidal Hardwood Swamp - G3, S3?
- Tidal Shrub Swamp - G? , S2?
- Tidal Freshwater Marsh: Mixed Type - G-?, S1
- Tidal Freshwater Marsh: Mud Flat Type - G? , S3?
- Tidal Freshwater Marsh: Wild Rice - Smartweed Type - G? , S3?
- Tidal Freshwater Marsh: Spikerush - Golden-club Type - G1G3, S1.

The ecological communities assessment identified existing and potential threats to the biodiversity of these wetland communities (McCoy and Fleming, 2000). The most significant threat is posed by invasive/exotic species. Aggressive invasive/exotic vegetation, such as common reed (*Phragmites australis)*, marsh dewflower (*Murdannia keisak*), hydrilla (*Hydrilla verticillata*), and Japanese stiltgrass (*Microstegium vimineum*) were encountered in installation wetlands. The Chinese mystery snail (*Cipangopaludina chinensis*), which can negatively alter aquatic vegetation habitat, was encountered throughout the installation. DCR-NHP also noted that these wetlands are vulnerable to storm water-related problems (e.g., sedimentation), degraded water quality, and boat wakes, as well as beaver activity (Hobson, 1996).

8.2.13.3 Rare Ecological Communities Management and Conservation Strategies

- Continue to use the NEPA process to evaluate, provide alternatives, and, if possible, eliminate risks to rare ecological communities.
- Continue protections in place for water quality within the industrial storm water permit program and the MS4 permit program.
- Continue to use existing land use restrictions around known rare communities to avoid earth moving activities and habitat/ecosystem impacts that might adversely impact communities.
- Avoid use of herbicide around known colonies and minimize herbicide use if needed for control of invasive exotic species that are a threat to the communities. Refer to the Integrated Pest Management Plan (Appendix D) for appropriate use of herbicides.
- Continue surveys to monitor changes to the rare ecological communities.

8.3 ENDANGERED, THREATENED, AND RARE SPECIES MANAGEMENT GOALS, OBJECTIVES, AND STRATEGIES

Fort Belvoir intends to continue the management emphasis on conservation of endangered, threatened and rare species (and their habitats), and rare ecological communities, as addressed in Section 8.2. In addition to the species specific strategies, Fort Belvoir will continue to use conservation land-use designations to protect rare species and important habitat areas for these resources, as addressed in Section 9. Management actions, such as invasive/exotic species management, storm water management and problematic wildlife management will continue to be implemented in order to control threats to these resources. Fort Belvoir will consider the potential for impacts to these resources when making land-use and operational decisions. Where practicable and consistent with installation mission, Fort Belvoir will undertake actions to enhance habitat conditions for endangered, threatened, and rare species.

8.3.1 Projects

Proposed activities that are considered Projects in this INRMP are activities that may potentially impact the environment and would need to be evaluated for the appropriate level of NEPA documentation. The following goals contain Projects within their objectives or strategies:

Goal 1: Continue to conserve habitats, and manage installation activities, to protect federal endangered and threatened species and state endangered and threatened species, and to reduce the risk of listing additional species

- ***Objective***: Avoid adverse impacts to any listed endangered, threatened, or species under consideration for federal listing.
- ***Strategy***:
  1) Continue to use the NEPA process and the other installation project and activity review processes to evaluate, provide alternatives, and, if possible, eliminate risks; incorporate endangered, threatened, and rare species/communities conservation requirements into all phases of facilities siting, construction, renovation, operation, maintenance, and demolition activities; and, in reviewing and supporting military training and testing activities.
  2) Review and update INRMP annually to account for changes in listing status.
  3) Continue to coordinate with USFWS, NMFS, VDGIF, DCR-NHP, and other appropriate agencies regarding protection requirements for federal and state protected species.
  4) Continue ongoing surveys to obtain scientific information on endangered, threatened, and rare species, and their habitats.
  5) Develop and participate in regional partnerships for threatened, endangered, and rare species, and rare ecological communities protection.
  6) Investigate and enforce violations of federal and state endangered species statutes and regulations. Continue to investigate and enforce violations of federal and state laws and regulations, as well as DoD, DA, and Fort Belvoir policies.
  7) Identify and conserve habitat areas for endangered, threatened, and rare species, and rare ecological communities, consistent with DoDI 4715.03 policy for designating specific areas of the installation that warrant special conservation as "Special Natural Areas" (Section 9) if consistent with the military mission. Currently, Fort Belvoir has five such areas: three refuges (ABWR, JMAWR, and T-17 Refuge) and two corridors (the FWC and Accotink Creek Conservation Corridor). Maintain designation of these areas, as environmentally constrained to development in the RPMP, and as warranting conservation consideration in other installation plans and documents. Designate new Special Natural Areas where legally obligated to do so.

Goal 2: Continue to conserve habitats/populations of rare animal and plant species, and ecological communities that have been prioritized for conservation by the Virginia NHP.

- **Objective**: Avoid adverse impact to rare species or their habitats.

- **Strategy**:
  1) Maintain land use restrictions and classifications of Special Natural Areas designation, and of environmentally constrained areas in the RPMP. (Section 9)
  2) Develop and implement a program to monitor rare plant and animal species, and rare ecological communities, including their habitats, as recommended by DCR-NHP (Hobson, 1996; 1997, 2013; McCoy and Fleming, 2000).

Goal 3: Continue to obtain scientific information on installation endangered, threatened, and rare species resources

- ***Objective*:** Support our knowledge of biodiversity, identify stressors and detect changes to biodiversity, to evaluate effectiveness of management actions.
- ***Strategy***:
  1) Update Planning Level Surveys (PLS) relevant to endangered, threatened, and rare species management.
  2) Perform year-round surveillance of endangered, threatened, and rare species conditions throughout the installation. This could include close observation, or monitoring, in lieu of detailed field survey.
  3) Develop and implement protocols for localized and/or issue-specific fish and wildlife surveys and studies as needed to support resource management, or for specific installation projects or mission activities.
  4) Identify opportunities for endangered, threatened, and rare species habitat, and other enhancement projects.
  5) Coordinate with DCR-NHP and other entities regarding stewardship of endangered, threatened, and rare species resources.
  6) Incorporate the location of habitat enhancement projects in the installation GIS.
  7) Perform an annual survey of a representative sample of habitat areas to assess changes, and to assess the success of management actions.
  8) Update and maintain baseline endangered, threatened, and rare species information in installation documents, records, databases, GIS, etc.

8.3.2 Actions

Actions are those activities that do not require ground breaking or environmentally altering activities. The following goals contain Actions within their objectives or strategies:

Goal 4: Continue to manage natural resources information so it is accessible to, and can be used by, installation natural resource managers.

- ***Objective***: Develop and implement an endangered, threatened, and rare species database, with the appropriate level of security for such information.
- ***Strategy***:
  1) Develop a system for storing and managing data. Keep installation GIS up to date.
  2) Enter electronic data.
  3) Scan and upload paper records.

Goal 5: Continue to enforce federal and state laws and regulations applicable to Fort Belvoir, as well as DoD, DA, and Fort Belvoir natural resources policies.

- **Objective:** Ensure Fort Belvoir remains in compliance with all applicable endangered and threatened species protection laws and policies.
- ***Strategy:***
  1) Perform compliance inspections.
  2) Perform inspections in support of enforcement actions and provide assistance.

Goal 6: Continue an educational outreach program to highlight protection of endangered and threatened species, and conservation of rare species.

- **Objective:** Increase the education and awareness level for the on-post public, as appropriate, and with consideration for the protection of sensitive species information.
- ***Strategy***:
  1) Provide opportunities for specialized awareness education/training (e.g., wood turtle identification and response projects, as required by wetland permits).
  2) Write and publish articles, as appropriate.

Goal 7: Continue to provide technical assistance in emergency situations that could affect endangered or threatened species.

- **Objective:** Ensure emergencies are responded to in a timely manner while meeting all regulatory requirements.
- ***Strategy***: Inspect and provide guidance.

Goal 8: Continue to issue installation-specific policies and guidance documents.

- **Objective:** Provide direction and guidance for projects and activities in areas where there may be endangered, threatened, or rare species.
- ***Strategy:*** Maintain the *Memorandum of Instruction – Northern Long-eared Bat Protection on Fort Belvoir.* Assess the need for, and prepare other guidance documents, as appropriate.

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9.0 SPECIAL NATURAL AREAS

DoD installations nationwide contain some of America's most precious natural resources. As steward of these resources, DoD is responsible not only for assuring for their conservation, but also for providing the public opportunities for appropriate educational and recreational use, consistent with military mission.

DoDI 4715.03, *Natural Resources Conservation* allows DoD Installations to provide "Special Natural Area" designation to specific areas of the installation that contain natural resources that warrant special conservation efforts if consistent with military mission. Such designation can be made to areas with special attributes, including areas with botanical, ecological reserve, geological, natural resources, riparian, scenic, zoological, and watchable wildlife qualities.

Fort Belvoir possesses a variety of ecologically significant natural resource areas. These include extensive wetlands and riparian forests. They also include habitats for: federally endangered or threatened species and Species at Risk for federal listing; state-listed endangered or threatened species; State Natural Heritage Inventory rare plant communities and rare plant and animal species; bald eagle; anadromous and other migratory fish species; and, PIF bird Species of Concern. (See Section 8 for regarding species presence.) Fort Belvoir also has regionally significant watersheds, and locally important wildlife migratory corridors. These on-post resource areas factor into biodiversity conservation efforts at the local, regional and national levels. The importance of conserving these on-post resources is underscored by the increasing urbanization locally, and throughout the Chesapeake Bay watershed.

Fort Belvoir began designating installation areas for special conservation efforts in 1979. Each area designation was made after careful evaluation for consistency with installation mission. Since the 1990's, these designations were made as mitigation commitments through the National Environmental Protection Act (NEPA) process. Fort Belvoir has five designated Special Natural Areas –ABWR, JMAWR, T-17 Refuge, Fort Belvoir FWC, and Accotink Creek Conservation Corridor. All of these areas possess significant biological and ecological attributes, and all afford high quality opportunities for outdoor recreation and for scientific study and education, consistent with military mission.

At Fort Belvoir, "Special Natural Area" designation protects significant natural resources by encouraging new facilities to be sited away from locations of significant natural resources; by evaluating mission activities for potential impact to significant natural resources and incorporating mitigations to offset unavoidable impacts (e.g., incorporating wildlife crossing structures on roads

through the FWC); and prioritizing natural resources monitoring and management efforts on the significant natural resources on post.

9.1 SPECIAL NATURAL AREAS POLICIES

9.1.1 Federal Special Natural Areas Policy

- ***The Sikes Act: (16 USC Section 670a, et seq.) as amended in the Sikes Act Improvement Act of 1997***
  The Sikes Act Improvement Act *Chapter 5C-Conservation Programs on Government Land*s (16 USC 670a. Section (a)(3)) requires military installations to carry out a program, "consistent with the use of military installations … to provide for (i) the conservation and rehabilitation of natural resources on such installations; (ii) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and (iii) subject to safety requirements and military security, public access to military installations to facilitate the use."

- ***Natural Resources Management Program (32 CFR 190)***
  This program provides in §190.4(a) that "the Department of Defense shall act responsibly in the public interest in managing its lands and natural resources. There shall be a conscious and active concern for the inherent value of natural resources in all DoD plans, actions, and programs". Also, "DoD lands shall be available to the public and DoD employees for enjoyment and use of natural resources, except when a specific determination has been made that a military mission prevents such access for safety or security reasons or that the natural resources will not support such usage" §190.4 (g).

9.1.2 State Special Natural Area Policy

None applicable.

9.1.3 Department of Defense Special Natural Area Policy

- ***Natural Resources Conservation Program (DoDI 4715.03)***
  This requires installations to follow an ecosystem-based approach to land management using adaptive management of natural resources, to inventory and protect important biological resources, and to promote biodiversity, while being able to provide continued access to installation air, water and land for realistic military training and testing. This instruction addresses various aspects of land management, and authorizes installations to designate as "Special Natural Areas" specific

areas of the installation having natural resources that warrant special conservation efforts consistent with military mission. This instruction also allows for multiple uses of an installation's natural resources, and for public access to these resources for recreation, education and scientific research and study compatible with the installation's ecosystem management goals and military mission.

Excerpts from DoDI 4715.03 Select Provisions Applicable to Special Natural Areas
• The principal purpose of DoD lands, water, 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 they provide. (Policy) • DoD shall demonstrate stewardship of natural resources in its trust by protecting and enhancing those resources for mission support, biodiversity conservation, and maintenance of ecosystem services. (Policy) • Areas on DoD installations that contain natural resources (ecological, scenic, recreational, or educational) that warrant special conservation efforts may be designated as special natural areas, as defined in the Glossary, where such conservation is consistent with the military mission. Such areas should be reassessed if mission requirements change, or if the property becomes excess and requires disposal. The INRMP will address special management provisions necessary for the conservation of each area. DoD components shall coordinate with appropriate agencies to support conservation law enforcement to enforce Federal and applicable State laws and regulations pertaining to the management and use of the natural resources under their jurisdiction. (Enclosure 3, Item 9) • [Definition] Significant Natural Resources. Resources identified as having special importance to an installation and/or its ecosystem. Natural Resources may be significant on a local, regional, national, or international scale. All threatened, endangered and at-risk species are significant natural resources that normally will require an INRMP. Installations that actively manage fish and wildlife, forestry, vegetation and erosion control, agricultural outleasing or grazing, or wetlands protection should be evaluated for significance, but normally will require an INRMP. An evaluation for significance should also consider the degree of active management, special natural features, aesthetics, outdoor recreational opportunities, and the ecological context of the installation.(Glossary)

Excerpts from DoDI 4715.03 Select Provisions Applicable to Special Natural Areas
• [Definition] Special Natural Areas. All areas officially recognized as having special attributes, including areas with botanical, ecological reserve, geological, natural resources, riparian, scenic, zoological, and watchable wildlife qualities. (Glossary) • 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. (Enclosure 3, Item 7a) • INRMPs shall describe areas and conditions appropriate for public access. (Enclosure 3, Item 7b) • The Department of Defense shall engage in public awareness and outreach programs to educate the public regarding the resources on military lands and DoD efforts to conserve those resources. (Enclosure 3, Item 8)

9.1.4 Department of the Army Special Natural Area Policy

- ***Environmental Protection and Enhancement (AR 200-1)***
  This regulation addresses the Army policy for natural resources conservation on DoD installations.

Excerpts from AR 200-1 Select Provisions Applicable to Special Natural Areas
• Provide for the conservation and rehabilitation of natural resources on Army lands. (4-3(a)(2) • Integrate natural resources stewardship and compliance responsibilities with operational requirements to help achieve sustainable ranges, training areas, and other land assets. (4-3)(c)(1) • Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with the mission and INRMP objectives. (4-3)(d) (4)(a) • Manage flora and fauna consistent with accepted scientific principles and in accordance with applicable laws and regulation and, where lands and waters are suitable, for conservation of indigenous flora and fauna. (4-3)(d)(4)(b) • Manage habitat to conserve and enhance existing flora and fauna consistent with the Army goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. (4-3)(d)(4)(c)

9.1.5 Fort Belvoir Special Natural Areas Policy

Fort Belvoir does not have an over-arching Special Natural Areas policy other than the policy specified in this INRMP.

9.2 BASELINE SPECIAL NATURAL AREAS CONDITIONS

In accordance with DODI 4715.03, Fort Belvoir has designated five locations on post as "Special Natural Areas" (Figure 9.1). These areas have natural resources that have been assigned a high conservation priority through federal or state statute or regulation (e.g., Endangered Species Act, Bald and Golden Eagle Protection Act), DoD or DA policy (e.g., DoDI 4715.03), DoD-partnered programs (e.g., Chesapeake Bay Program, PIF Program), NEPA mitigation commitment (e.g., BRAC 1988 NEPA, BRAC 2005 NEPA, RPMP NEPA), the state Natural Heritage Program, or have been recognized as being important to local or regional ecosystem function (e.g., wildlife migratory routes). The five Special Natural Areas are:

- Accotink Bay Wildlife Refuge (ABWR)
- Jackson Miles Abbott Wetland Refue (JMAWR)
- T-17 Refuge
- Fort Belvoir Forest and Wildlife Corridor (FWC)
- Accotink Creek Conservation Corridor

Fort Belvoir maintains these Special Natural Area designations within all installation planning documents and within the installation GIS. The 2015 Fort Belvoir Real Property Master Plan (RPMP) identifies these Special Natural Areas as part of the "Environmental Constraints Complex", an area classified as being "least suitable for development".

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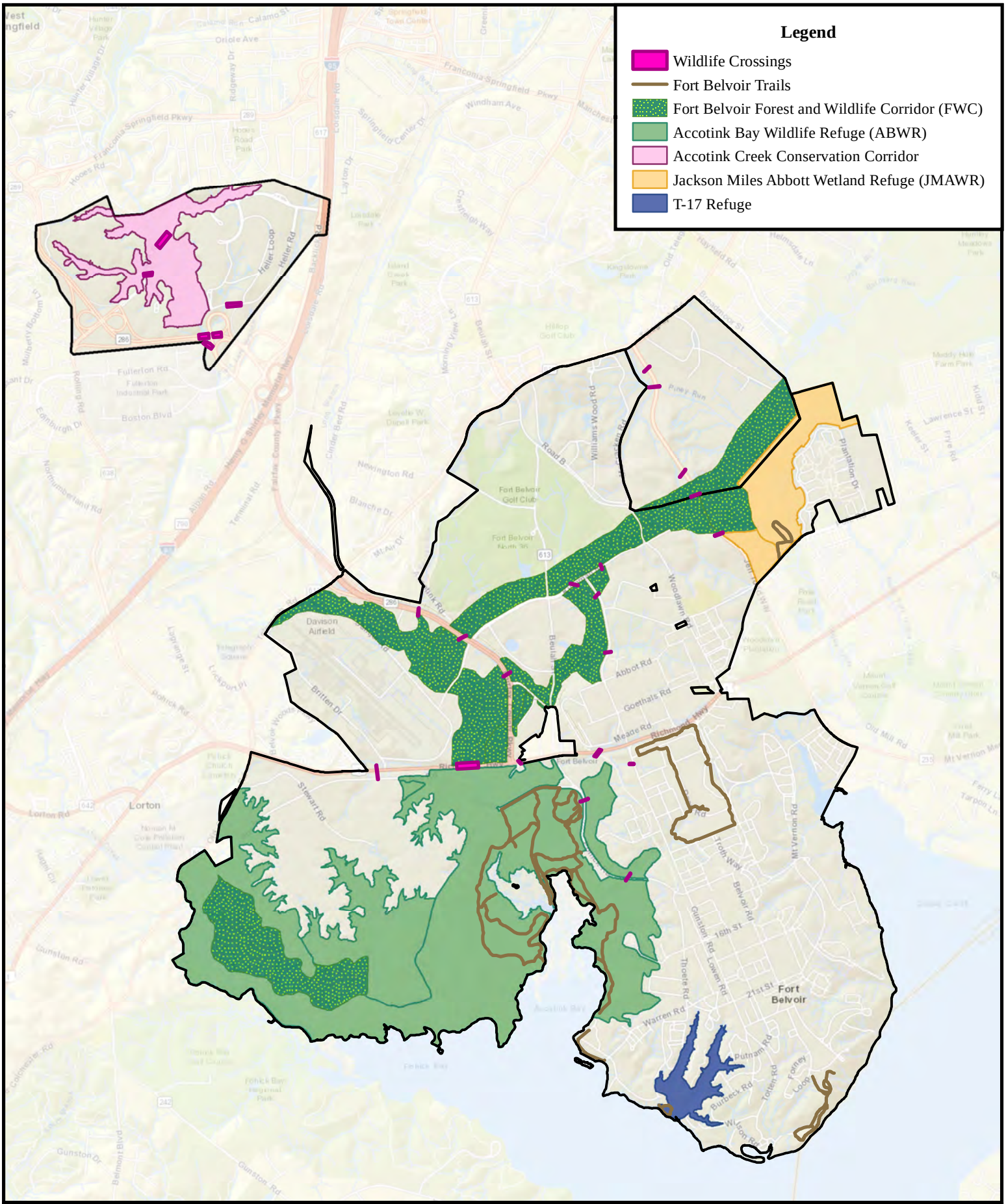

DESIGNATED SPECIAL NATURAL AREAS ON FORT BELVOIR

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Figure 9.1

Source: Fort Belvoir GIS, Google road maps,

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9.2.1.1 Accotink Bay Wildlife Refuge

History

The ABWR (Figure 9.1) was established in 1979 to protect areas of recognized ecological significance, most notably the freshwater tidal marsh and climax hardwood forest adjacent to Accotink Bay, and to provide the public with opportunities for environmental education and low-intensity outdoor recreation. The refuge initially encompassed a 460-acre area along Accotink Bay in the south-central part of the installation. Through a series of subsequent expansions, the ABWR was enlarged to encompass the entire shoreline/slope area around Accotink and Pohick Bays, the entire riparian area along Accotink Creek south of U.S. Route 1, part of the Pohick Creek riparian area, portions of the upland plateau of the South Post training area, and a slope area on South Post along the east side of Pohick Road to a total refuge size of 1,945 acres. The expansions were undertaken, as military mission changes allowed, to incorporate more of the recognized sensitive natural resources into the refuge. Since the 1990's, these expansions were undertaken as NEPA mitigation actions to offset impacts from development. The most recent expansions came about through the 2005 BRAC Environmental Impact Statement (EIS) Record of Decision (ROD) (U.S. Army, 2007) which extended the refuge boundary in the Southwest Training Area up to the 125-foot contour, and the 2016 RPMP EIS ROD (U.S. Army, 2016a), which added two areas to the refuge - a small parcel in the central portion of the Southwest Training Area and a parcel east of Pohick Road on South Post. These expansions were done to add bald eagle habitat, steep slopes, wetlands, sensitive watershed area, and rare species habitat.

The ABWR includes all of the tidal marsh wetlands associated with Accotink and Pohick Bays. Several rare plant and animal species, and rare plant communities occur in these wetlands. The refuge includes the lower part of Subwatershed 48 (Figure 5.2), a rare example of an undisturbed Mid-Atlantic upper Coastal Plain stream, and the riparian protection areas associated with lower Accotink Creek, Accotink Bay, lower Pohick Creek and Pohick Bay. Accotink and Pohick Creeks are used by anadromous and other migratory fish. The refuge includes several active bald eagle nest sites, and is within the federal- and state-designated Potomac River Eagle Concentration Area. The refuge includes habitat for a federal threatened bat, several state threatened and endangered bats, habitat for federal threatened (state endangered) small whorled pogonia, habitat for state-threatened wood turtle, as well as habitat for multiple PIF bird Species of Concern.

The ABWR falls within the National Audubon Society's Lower Potomac River Important Bird Area and is part of the Virginia Coastal Birding Trail published by the VGDIF.

Existing Conditions and Use

There are no buildings in the ABWR and existing infrastructure is limited to the gate-controlled network of paved and unpaved training roads, a network of recreational hiking trails, and several utility corridors that pass through the area. The refuge boundary overlaps with a portion of several closed installation landfills. Pohick Road, which has refuge on both sides, had three wildlife crossing structures (one specifically for reptiles and amphibians) installed as part of the BRAC 2005 Infrastructure project (Figure 9.1). Two wildlife crossing structures have been installed on U.S. Route 1 by the Federal Highway Administration (FHWA) as part of the U.S. Route 1 road widening project.

The ABWR includes several operational (active) and closed training ranges. These range areas continue to be managed and used in accordance with their training designation. Operational training areas are controlled by the Fort Belvoir Directorate Plans, Training, Mobilization and Security (DPTMS). Routine types of military training activity on Fort Belvoir generally have low disturbance to natural resources. DPTMS coordinates environmental assessment requests for non-routine training with Directorate of Public Works (DPW)-Environmental Division. Closed training areas are being assessed through the Military Munitions Response and Installation Restoration programs.

Recreation facilities within the ABWR are limited to the approximately 14-mile hiking trail network and associated public access and educational features (Figure 9.1). Virtually all of the ABWR trail network has a natural surface (except for a 0.3-mile section of pervious stone within a flood-prone area and the paved 0.5-mile Pohick Loop Trail, a trail accessible to persons with disabilities). There are several wildlife observation structures along the trail network and parking facilities at three trailheads (entrance at the SSG John D. Linde Visitor Center along Pohick Road, Pohick Loop Trail and Basin Trail). Information kiosks and interpretive signs are located at the major trail heads and along trails. There are no restroom facilities.

The ABWR hiking trail system is accessible to any person authorized to be on Fort Belvoir. Trail use is by pedestrian traffic only, and users must remain on the trails. Except for hunting and fishing, and other activities specifically approved by DPW-Environmental Division, refuge users must remain on the trails. Dogs are allowed on the trails and must be leashed at all times. Activities with the potential to disrupt or disturb land and natural resources, such as bike/ORV or ATV, horseback riding, boat launches and landings, are prohibited. Hunting and fishing are allowed in accordance with the installation's hunting and fishing programs (Section 10), however camping is not permitted. Organized group events and any use other than hiking, hunting or fishing, must be submitted to DPW-Environmental Division for review and approval because of the potential for impact to sensitive resources and risk of access to Unexploded Ordinance (UXO) areas.

The ABWR has been, and continues to be, accessible, for recreation and for scientific study and environmental education (consistent with military mission and operations and security requirements). The refuge has been used for outdoor classroom and study by several universities, include George Mason University, and for research by several institutions, including the Smithsonian Institution. Requests for such use must be submitted to DPW- Environmental Division for review and approval. Persons coming into the refuge for such activities must have authorized access to Fort Belvoir, and be briefed on and agree to abide by, all installation force protection, safety and environmental protection requirements (e.g., UXO briefing). Persons performing scientific study/research must possess, and adhere to, the conditions of all applicable permits (e.g., VDGIF's Scientific Collection Permit).

Routine maintenance of the ABWR trail system is done under the installation's Real Property Maintenance contract. Purchase, installation and maintenance of signs and educational displays may be accomplished under that contract, or be contracted separately. Major improvements, such as the replacement of the suspension bridge over Accotink Creek (completed in 2015) are generally done under separate contracts. Small projects may be accomplished as volunteer projects (e.g., Eagle Scout projects).

The ABWR Environmental Education Center (ABWR EEC), located along Accotink Bay (outside the ABWR boundary) prior to the entrance to Basin Trail, provides a focal point for persons visiting the refuge. The Center is open by appointment only, and provides natural resource information, exhibits, and programs. The Center serves as the base location for Fort Belvoir's Conservation Education Program.

9.2.1.2 Jackson Miles Abbott Wetland Refuge

History

The JMAWR (Figure 9.1) was established in 1988 to protect an area of sensitive wetlands along Dogue Creek, and to provide public access to an important bird watching area on post. The refuge, originally 146 acres, was expanded to 191 acres in 2007 as a mitigation action under the BRAC 2005 EIS ROD (U.S. Army, 2007). The BRAC 2005 expansion was done to include additional watershed area and rare species habitat.

The JMAWR includes a beaver-impounded section of Dogue Creek that supports several state-rare animal species and the 1.5-acre man-made Mulligan Pond. JMAWR is part of a larger forested wetland system that continues beyond Fort Belvoir's installation boundary into Humphreys Engineering Center (HEC), and into Fairfax County's Huntley Meadows Park. The JMAWR includes all of the resource protection areas along Dogue Creek main stem (in the North Post). The refuge includes habitat for a federal threatened bat and several state threatened

and endangered bats, habitat for federal threatened (state endangered) small whorled pogonia, habitat for state threatened wood turtle, and habitat for multiple PIF bird Species of Concern (Section 7.2.2). Migratory fish passage through JMAWR is questionable due to an off-post blockage in the Dogue Creek channel downstream from JMAWR (near the stream crossing on U.S. Route 1), outside Fort Belvoir's boundary.

The JMAWR falls within the National Audubon Society's Lower Potomac River Important Bird Area and is part of the Virginia Coastal Birding Trail published by the VDGIF.

Existing Conditions and Use

Existing facilities are limited to the 0.6-mile hiking trail, a portion of which is paved and accessible to persons with disabilities, as well as a wildlife viewing structure (rebuilt in 2016 to replace the original structure destroyed by vandal's fire) that overlooks the wetland to the north. Mulligan Pond contains three fishing piers accessible to persons with disabilities. The pond underwent extensive renovations in the late 1990's to install a new water control structure, stabilize the inlet and outlet areas, dredge for sediment removal, replant vegetation, and stock the pond. The entrance along Pole Road contains a parking facility and an information kiosk. There are no buildings, restrooms, or active ranges in the area and the only road is a gated, paved service road from the parking area to the pond. Several utility corridors pass through the area. Maintenance of the infrastructure in JMAWR is the same as for ABWR.

Hunting and fishing are allowed in JMAWR, in accordance with the installation's Hunting and Fishing Programs (Section 10). Other activities as well as policies and restrictions are the same as for ABWR.

9.2.1.3 T-17 Refuge

History

Operational Range T-17 Refuge (Figure 9.1) is located on the southern extent of Fort Belvoir Main Post along the Gunston Cove shoreline. This training area is under the operational control of DPTMS.

The T-17 area has long been recognized as an area of ecological significance. A groundwater seepage along one of its two streams is the only known location in the world for the groundwater dwelling Northern Virginia Well Amphipod (*Stygobromus phreaticus*) (Section 8). This area is included in the federal and state-designated Potomac River Eagle Concentration Area and contains habitat for several PIF bird Species of Concern (Section 7.2.2). The area is forested, includes riparian and wetland areas, habitat for a federal threatened bat and for several state threatened and endangered bats, habitat for federal threatened

(state endangered) small whorled pogonia, rare plant communities, and habitat for rare species. The T-17 Refuge falls within the National Audubon Society's Lower Potomac River Important Bird Area.

The T-17 Refuge was designated as a Special Natural Area under the 2005 BRAC EIS ROD (U.S. Army, 2007a) to protect *Stygobromus phreaticus*. The boundaries of this Special Natural Area were delineated to include the groundwater seepage area where *Stygobromus phreaticus* and other rare *Stygobromus* species are encountered, along with an estimated area of influence for groundwater recharge to that seepage area. The boundary delineation took into account installation mission and included the steep-sloped riparian areas and down-slope wetlands, areas that are not suitable for development, and excluded the upper, previously disturbed plateau (now in use as ball fields). For ease of management, the boundary of this Special Natural Area was set at the 100-foot contour and below. The area encompasses approximately 70 acres.

Existing Conditions and Use

There are no buildings or public roads in the T-17 Refuge; however, an unimproved utility access road runs north-south from the ball fields, along the ridge (outside of the boundary) to the utility corridors located mid-way through the refuge.

In 2008, a fishing/watchable wildlife pier (accessible to persons with disabilities) was constructed at the base of T-17 on Gunston Cove, just outside the limit of the T-17 Refuge, to replace the previous pier that was destroyed by Hurricane Isabel in 2003. The new pier was engineered and constructed for pedestrian traffic only and does not support boat docking. The pier area includes a parking facility, and kiosk with educational displays. In 2011, a trail was constructed to support the Wounded Warriors Program and is located in the lower, near-shore area of T-17, connecting to the parking facilities at the pier.

Facilities maintenance, as well as area access and use policies, for the T-17 Refuge are the same as for ABWR. Hunting and fishing are allowed in accordance with the installation's hunting and fishing programs.

9.2.1.4 Fort Belvoir Forest and Wildlife Corridor

History

The Fort Belvoir FWC (Figure 9.1) was established in 1993 as the result of several NEPA mitigation commitments to offset the ecological impacts of habitat fragmentation caused by major construction projects on post. The 1988 BRAC EIS ROD (U.S. Army, 1991) acknowledged the presence of a functioning wildlife corridor through Fort Belvoir. That ROD committed to developing and implementing a Corridor Management Plan. The Fort Belvoir FWC Management

Plan was completed in 1993 and incorporated into the 1993 Fort Belvoir RPMP and its Environmental Assessment (EA) Finding of No Significant Impact (FNSI) (U.S. Army 1993 a,b,c).

The Fort Belvoir FWC was established to protect significant wildlife habitat, and to maintain a continuous area of natural forest habitat connecting larger natural areas to the north and south of Fort Belvoir, facilitating wildlife movement through the installation. The FWC was defined as having a minimum width of 250 to 300 meters (820 to 984 feet), based upon the results of a George Mason University study of minimum corridor widths for wildlife migration (Ernst et al., 1998). As shown in Figure 9.1, the FWC extends from (and overlaps with) the JMAWR in the northeastern part of the installation to the ABWR in the southwestern part. The FWC and the two refuges together provide, by definition, a continuous forested band through Fort Belvoir.

The FWC includes the majority of the installation's habitat for the state threatened wood turtle, habitat for a federal threatened bat and several state endangered and threatened bats, habitat for federal threatened (state endangered) small whorled pogonia, and habitat for several PIF bird Species of Concern. The FWC also includes all of the riparian forest buffer and wetlands along Accotink Creek, and along two major drainages to Accotink Creek. It also falls within the National Audubon Society's Lower Potomac River Important Bird Area.

The Fort Belvoir FWC encompasses 980 acres, exclusive of where it overlaps the refuge areas. The FWC underwent a minor modification of its boundaries in 1999, as it was incorporated into the installation GIS, and was expanded in 2016 as a mitigation action in the EA FNSI for INSCOM construction (U.S. Army, 2012, 2016b). The 2016 expansion added a small area (a parcel at the southeast corner of the intersection of Gunston and Kingman Roads) to the FWC to offset a small area of unavoidable construction within the FWC. The FWC was expanded again in 2017 as a NEPA mitigation action under the 2015 Fort Belvoir RPMP EIS ROD (U.S. Army, 2016a). This expansion added the remainder of the Accotink Creek riparian area on Main Post to the FWC.

Existing Conditions and Use

There are no buildings within the FWC, however roads, trails, utilities and other infrastructure traverse the FWC and are unavoidable. Fort Belvoir has incorporated wildlife crossing structures into the roads to facilitate wildlife movement with a total of nine wildlife crossing structures on roads within, and near, the FWC (Figure 9.1). These crossing structures generally are modifications to bridges and culverts that foster wildlife use. Such design modifications may include over-sizing culverts, using natural surface bottoms, or day-lighting the tops (by using grids), and also include land modification and

structures (e.g., fencing) to guide wildlife to the crossings. These are the only facilities specifically constructed to serve FWC function.

Fort Belvoir has undertaken a number of projects to improve, or that resulted in improvement of, FWC function. Such projects included removing unneeded fencing, reforesting disturbed areas, and replacing overhead utility transmission lines with underground lines. The latter is allowing the existing cleared rights-of-way to re-vegetate, diminishing previously existing habitat fragmentation. New street lighting along roads in the FWC strives to use light fixtures with reduced light scatter.

Except for the portions of the FWC that overlap with the installation Golf Course or the refuges, there are no recreational facilities, hiking trials, or active ranges. The FWC is accessible for hunting, in accordance with the installation's hunting program, however there are no fishing opportunities in the section of the Corridor between the refuges. That section of the Corridor is not open to public use, except for installation-authorized events.

9.2.1.5 Accotink Creek Conservation Corridor

History

The Accotink Creek Conservation Corridor was established in 2005 to protect the Accotink Creek riparian area through FBNA (Figure 9.1). This predominantly forested 191-acre area serves as a wildlife migratory corridor, and supports habitat for a federal endangered bat and several state threatened and endangered bats, and habitat for federal threatened (state endangered) small whorled pogonia, state-listed threatened wood turtle and for several other species of management concern. Designation of this Special Natural Area was a mitigation action of the 2005 BRAC EIS ROD (U.S. Army, 2007a).

Existing Conditions and Use

There are no buildings, trails, recreational facilities, or ranges in this area, only unimproved roads and utilities. Except for hunting under the Fort Belvoir hunting program, this area has no recreational use. Requests for access for other recreation, or scientific study/education must be made to DPW-Environmental Division for review and approval.

There is an operational bridge and an abandoned bridge over Accotink Creek. The abandoned bridge has been identified as needing to be removed. One of the tributaries to Accotink Creek is crossed by a BEBO Arch, a precast concrete structure, which functions as a wildlife crossing structure (Figure 9.1). There are a total of six wildlife crossings within FBNA in the vicinity of the Accotink Creek Conservation Corridor.

9.3 SPECIAL NATURAL AREAS MANAGEMENT

The results of the planning level natural resources surveys of Fort Belvoir (Sections 5 through 8) document a variety of ecologically significant natural resources within the boundaries of the designated Special Natural Areas on post (Figure 9.2). The survey results warn that these resources are vulnerable to a number of threats, including displacement by exotic species; de-stabilization, erosion or sedimentation resulting from stormwater problems; damage/mortality caused by insects or disease; disturbance/destruction caused by wildlife (e.g., deer overbrowsing, beaver activity); or, by overuse by humans.

The resources within the designated Special Natural Areas, while generally protected from direct loss to development through their "environmental constraints" designation in the 2015 Fort Belvoir RPMP, could be affected by unavoidable land disturbances for installation operations (e.g., infrastructure construction and maintenance, training area use, Military Munitions Response and Installation Restoration Program work, etc.). Natural resources in those areas are also vulnerable to "spill-over" impact by any adjacent development (e.g., lighting, noise, activity, accidental chemical spills, stormwater runoff, problem wildlife, etc.).

9.3.1 DCR-NHP Conservation Area Recommendations

Virginia DCR-NHP, through two natural heritage inventories (Hobson, 1996; Hobson, 1997), recommended managing specific installation areas for conservation of significant natural resources. *A Natural Heritage Inventory of the U.S. Army Fort Belvoir, Virginia* (Hobson, 1996) recommended the establishment of conservation areas, covering ABWR and JMAWR to protect the significant resources within and adjacent to these areas from development and other land disturbing activities, and to buffer the adverse impacts of nearby developed land uses on sensitive resources (Section 8). DCR-NHP's *A Natural Heritage Zoological Inventory of U.S. Army, Fort Belvoir* recommended establishing a third conservation area for T-17 to protect *Stygobromus phreaticus* (Hobson, 1997) (Appendix K). Fort Belvoir uses these recommendations to inform designation and management of the installation's Special Natural Areas.

9.3.1.1 Refuge Management Recommendations

The *Comprehensive Management Plan for the Fort Belvoir Refuge Complex* (Paciulli, Simmons and Associates, Ltd., 1998b) took into account DCR-NHP's conservation recommendations, and recommended that management priority be given to the protection of natural resources within the refuges from manmade or natural disasters by addressing:

- Use Management

- Boundaries and Buffers
- Natural Resources Conservation
- Educational Opportunities
- Facilities Maintenance

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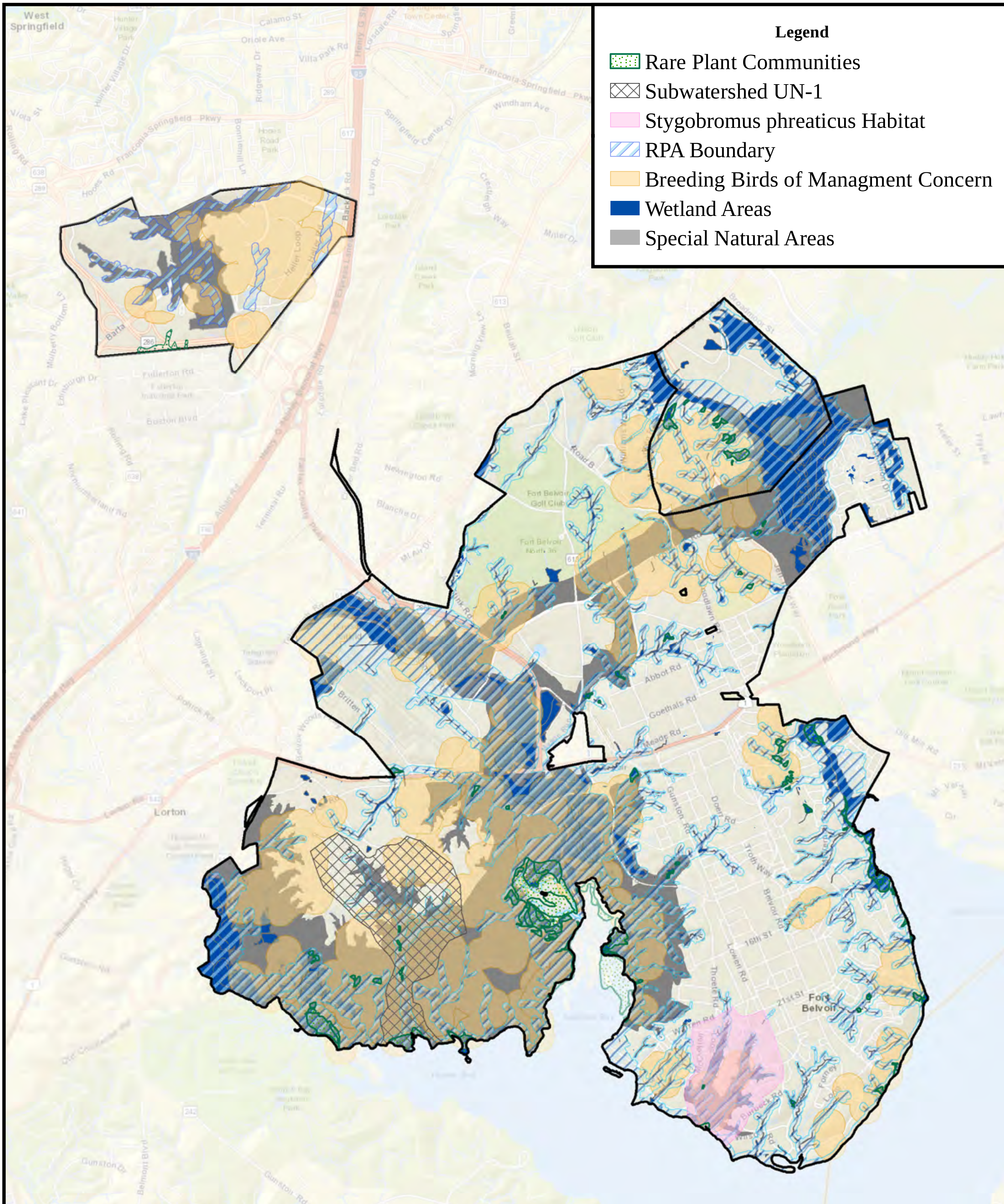

1 inch = 0.75 miles

0 0.25 0.5 1 Miles

ECOLOGICALLY SIGNIFICANT AREAS ON FORT BELVOIR

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Figure 9.2

Source: Fort Belvoir GIS, Google road maps

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Table 9-1 presents a summary of the plan's key management recommendations, and their implementation status, organized according to these five topics.

Table 9-1: Key Management Recommendations from the Comprehensive Management Plan for the Fort Belvoir Refuge Complex	
Topic	***Management Recommendations***
Use Management	• Limit public access to the presently accessible areas, unless future studies specifically indicate that additional public areas can be created without damage to the ecosystem. • Prohibit horses, bicycles, ORVs, boat landings and launchings, etc. • Allow classes and scientific research and inventory in the non-public areas. • Allow archery hunting in the public and non-public areas as a means to control the deer population. • Allow fishing in Mulligan Pond, Dogue Creek, Accotink Creek, Pohick Creek, and Accotink and Pohick Bays. • Limit recreation to hunting, fishing, and passive recreational activities such as wildlife/nature photography. • Prohibit/control large organized recreational events such as volksmarches and orienteering competitions. • Encourage non-disruptive military use if other training areas do not provide proper space or training scenarios. *(Military training occurs within the refuges, mostly within ABWR. Public access to the refuges has been managed to be compatible with natural resources conservation. This multi-use initiative is on-going.)*
Boundaries and Buffers	• Add training area T-10 to the ABWR, to protect the active bald eagle nest. *(This was accomplished as a result of the BRAC 2005 NEPA and the RPMP 2016 NEPA mitigations that included ABWR expansion.)* • Add the landfills to the refuge(s) since other (land-disturbing) uses are not feasible at the landfills. Landfills occur in areas T-6, T-16, W-1, W-3, and W-4. *(This was accomplished as a result of the BRAC 2005 NEPA mitigations that included ABWR expansion.)* • Modify the refuge boundaries to follow the top of slopes and specific contours. Add small areas, as necessary, to bring the refuge boundaries out to known fences, roads, or other geographic feature. Delete small, isolated segments that are not functionally part of the refuge.

Table 9-1: Key Management Recommendations from the Comprehensive Management Plan for the Fort Belvoir Refuge Complex	
Topic	***Management Recommendations***
	(This was accomplished as a result of the BRAC 2005 and the RPMP 2016 NEPA mitigations that included ABWR expansion.) • Expand JMAWR (1) to the south/southwest to include the remainder of the wetlands and floodplains southwest of Mulligan Pond and along the south side of Kingman Road, and (2) to the north to include the wetlands and bottomlands from Kingman Road north to Telegraph Road. *(Expansion of JMAWR northward to Kingman Road, and westward to Jeff Todd Way was accomplished as a result of the BRAC 2005 NEPA mitigations that included JMAWR expansion. Additional expansion is not practicable.)* • Provide a buffer to both refuges to protect against development adjacent to the refuges, in the event training departs, and the training land is developed or excessed. *(Given the expansions that resulted from the BRAC 2005 NEPA mitigations, this recommendation is no longer being considered.)*
Natural Resources Conservation	• Protect and enhance conditions for endangered, threatened, and rare species and their habitats (Section 8). • Protect and enhance wetlands. • Protect and enhance habitat conditions for anadromous fish species. • Protect and enhance habitat conditions for non-game bird populations. • Conserve riparian forest buffer habitat. *(Projects have been identified and undertaken to enhance habitats, and to restore riparian areas within the refuges and corridors. This initiative is on-going.)*
Educational Opportunities	• Ensure that the refuges are a showcase for Fort Belvoir and other partners in environmental education and resource management. • In collaboration with various partners, provide a wide range of innovative environmental education programs and activities. • Ensure that the primary objectives of environmental education are to conserve and enhance biological

Table 9-1: Key Management Recommendations from the Comprehensive Management Plan for the Fort Belvoir Refuge Complex	
Topic	***Management Recommendations***
	resources, and to motivate citizens to learn the role of management in the maintenance of healthy ecosystems. *(The installation's environmental education and outreach programs highlight the refuge and corridor areas, and the natural resources within them. This initiative is on-going.)*
Facilities Maintenance	• Rehabilitate Mulligan Pond, and repair and upgrade the public access facilities at JMAWR. • Repair and upgrade public access facilities at the ABWR. • Construct a refuge headquarters and environmental education center at the ABWR. *(The pond and public access facilities underwent major rehabilitation and upgrade in the early 2000's. The ABWR Environmental Education Center was established in the early 2000's. These initiatives are on-going.)*

Source: Paciulli, Simmons and Associates, Ltd., 1998b

9.3.1.2 Forest and Wildlife Corridor Recommendations

The Fort Belvoir Forest and Wildlife Corridor Management Plan (Paciulli, Simmons and Associates, Ltd., 1993) recommended two broad conservation management initiatives to conserve the habitat value of the FWC and to protect and enhance wildlife movement: (1) restrict disruptive activities within the corridor, and (2) enhance natural habitat within the corridor. The plan stressed establishing and maintaining woodland habitat diversity, restricting land clearing, limiting public access, reducing edge habitat and providing wildlife habitat enhancement. Key management recommendations from the plan are summarized below:

- Reduce fencing within the corridor.
- Add wildlife crossing structures at existing roads (e.g., U.S. Route 1) and in new road designs.
- Use plantings, integrated pest management practices and stormwater management practices to minimize impacts of the North Post Golf Course.
- Use forest management practices (e.g., forest fire protection, insect and disease control, timber stand improvements) to preserve biodiversity and maintain forest health.
- Reforest disturbed areas.
- Avoid large-scale human intrusions that may fragment the corridor.
- Provide awareness training in corridor conservation and management.

In 1999, Fort Belvoir prepared an updated corridor management plan (Paciulli, Simmons and Associates, Ltd., 1999c). The 1999 plan update management recommendations are summarized below:

- Refine the corridor boundary.
- Maintain and enhance existing wildlife crossing structures.
- Identify locations for future wildlife crossing structures, and reforest disturbed and open areas.
- Safeguard the corridor and its function from future encroachment by development.

9.3.2 Previous and Current Special Natural Area Management Actions

9.3.2.1 Accotink Bay Wildlife Refuge

Key management actions that have been undertaken in the ABWR include:

- Executed a series of boundary expansions, the latest of which added the remainder of the bald eagle habitat, the remainder of the key areas of wetlands and riparian corridor, habitat for several species of federal and state threatened and endangered bats, habitat for federal threatened (state endangered) small whorled pogonia, and additional habitat areas for rare species and PIF bird Species of Concern.
- Designated the ABWR as part of the "Environmental Constraints Complex" in the 2015 RPMP. (This Complex is classified in the Master Plan as "least suitable for development".)
- Except for the mission-directed construction of the Access Control Point (the SSG John D. Linde Visitor Center) on Pohick Road, emphasized siting of new facilities outside the refuge boundaries, through the 1993 RPMP and the 2015 RPMP.
- Completed several major habitat enhancement projects, including vegetation planting/enhancements in T6-B, W-1, W-3 and W-6, and tree thinning in W-1 and T-9 to improve habitat for PIF Species of Concern bird species, and for other species of management priority.
- Coordinated timber stand improvement actions with wildlife habitat enhancement actions within several planted pine stands.
- Initiated several multi-year wildlife monitoring projects (in the broad installation area stretching from ABWR through the FWC and into JMAWR). These projects include long-term acoustic monitoring for northern long-eared bat and other bats, reptile and amphibian monitoring through series of cover boards and frog-loggers (call loggers), radio-telemetry of bats, and radio-telemetry of turtles, and seasonal bird surveys.

- Used wildlife seed mixes to stabilize disturbed areas (e.g., several Fairfax County sewer line projects, installation utility and infrastructure projects, area burned by wild fire, etc.).
- As part of the installation watershed management program (initiated under the 2001 INRMP), began performing stream restoration projects to correct stormwater management problems, and restore riparian habitats. To date, three stream restorations have been completed in subwatersheds to Accotink Creek. Additional restoration projects are in various stages of planning/design. Stream restoration is a mitigation commitment of the EIS ROD for the 2015 RPMP.
- Initiated several invasive/exotic vegetation control projects, including *Phragmites australis* control actions.
- Installed and maintained various wildlife habitat improvement structures (including wood duck nest boxes) throughout the refuge.
- Renovated and upgraded the refuge trail system, including trail realignment, footbridge repair/replacement, replacement of the large suspension bridge over Accotink Creek, and construction and maintenance of wildlife viewing structures. Maintained the Pohick Loop Trail as accessible to persons with disabilities.
- Developed and implemented a refuge facilities maintenance program, as part of the installation's Real Property Maintenance Contract.
- Corrected culvert and other water-related issues during the training roads renovation project.
- Installed three wildlife crossing structures (one specifically for reptiles and amphibians) on Pohick Road as part of the BRAC 2005 Infrastructure project.
- Developed and installed new interpretive displays in association with the trail system.

9.3.2.2 Jackson Miles Abbott Wetland Refuge

Key management actions that have been undertaken in the JMAWR include:

- Expanded the boundary to include additional wetlands and watershed area, habitat for several species of federal and state threatened and endangered bats, habitat for federal threatened (state endangered) small whorled pogonia, and habitat for PIF bird Species of Concern.
- Designated the JMAWR as part of the "Environmental Constraints Complex" in the 2015 RPMP. (This Complex is classified in the Master Plan as "least suitable for development").
- Emphasized the siting of new facilities outside the refuge boundaries, through the 1993 RPMP and the 2015 RPMP
- Renovated Mulligan Pond, including installation of new water control structure, stabilization of inlet and outlet areas, bank planting, dredging for sediment removal, and fish stocking

- Renovated and upgraded the refuge trail system, including trail realignment, construction of a wildlife viewing structure, a trail section that is accessible to persons with disabilities, and construction of three fishing piers accessible to persons with disabilities
- Renovated the refuge main entrance, including parking facilities
- Developed and implemented a refuge facilities maintenance program, as part of the installation's Real Property Maintenance Contract
- Developed and installed new interpretive displays.
- Replaced the wildlife viewing structure and the refuge marker that were destroyed by vandals

9.3.2.3 Operational Range T-17 Refuge

Key management actions that have been undertaken in the T-17 Refuge include:

- Established this refuge to protect significant natural resources, including *Stygobromus phreaticus*, and wetlands.
- Designated the T-17 Refuge as part of the "Environmental Constraints Complex" in the 2015 RPMP. (This Complex is classified in the Master Plan as "least suitable for development".)
- Emphasized the siting of new facilities outside the refuge boundaries, through the 2015 RPMP.
- Constructed a nature trail in the lower section, and connected the trail to the recently constructed fishing pier on Gunston Cove in T-17.
- Continued to monitor the T-17 seep for *Stygobromus phreaticu*s and to sample groundwater wells in the area for water quality.

9.3.2.4 Fort Belvoir Forest and Wildlife Corridor

FWC management actions to date have focused on conserving the FWC as a continuous forested band through Fort Belvoir, and maintaining and enhancing wildlife movement through the Corridor. Management actions that have been accomplished since 1993 include the following:

- Executed a series of boundary expansions (see section 9.2.1.4), the latest of which added the remainder of the Accotink Creek riparian area on Main Post, wetlands, habitat for several federal and state threatened and endangered bats, habitat for federal threatened (state endangered) small whorled pogonia, habitat for state threatened wood turtle habitat, and habitat areas for rare species and PIF bird Species of Concern.
- Designated the FWC as part of the "Environmental Constraints Complex" in the 2015 RPMP. (This Complex is classified in the Master Plan as "least suitable for development".)
- Emphasized siting of new facilities outside the FWC, through the 1993 RPMP and the 2015 RPMP.

- Developed and installed nine wildlife crossing structures on post for the Fairfax County Parkway, Gunston Road, Kingman Road and Jeff Todd Way where these roads cross the FWC.
- Monitored the existing crossing structures for wildlife use. Executed a project to correct conditions at five existing crossings to improve wildlife use. Two locations required site work to clean out sedimentation; three required physical repair/modification to the structure.
- Coordinated with FHWA for them to construct two wildlife crossing structures on U.S. Route 1 as part of the U.S. Route 1 road widening project, (where it passes through the FWC).
- Coordinated with FHWA for them to remove pavement from, and re-forest, the closed section of Woodlawn Road through the FWC. This is a mitigation for the construction of the Richmond Highway-Telegraph Road Connector (now known as Jeff Todd Way) through the FWC (U.S. DOT 2007).
- Minimized land-disturbing activities and tree removal within the FWC
- Relocated the southern portion of the Intelligence and Security Command security fence outside of the FWC.
- Reforested disturbed areas of the FWC (e.g., area between the North Post Golf Course and Kingman Road, open area along Fairfax County Parkway through the FWC, area between Beulah Road and Backlick Road, area east of Beulah Road, southern perimeter of the Golf Course, etc.).
- Prioritized the FWC to receive plantings to off-set tree removals elsewhere on the installation.
- Executed a natural stream channel restoration project to improve conditions at one of the Fairfax County Parkway wildlife crossing structures. Have several more stream restoration projects in various stages of planning/design.
- Followed the installation's Integrated Pest Management Plan and a Nutrient Management Plan at the Golf Course.
- Allowed for regeneration of previously cleared utility rights-of-way after overhead lines were undergrounded.

9.3.2.5 Accotink Creek Conservation Corridor

Key management actions that have been undertaken in the Accotink Creek Conservation Corridor include:

- Emphasized siting of new facilities outside boundaries of this area, through the 2015 RPMP.
- Designated the Accotink Creek Conservation Corridor as part of the "Environmental Constraints Complex" in the 2015 RPMP. (This Complex is classified in the Master Plan as "least suitable for development".)

- As part of the BRAC 2005 construction on FBNA, installed a BEBO Arch to function as a wildlife crossing structure on an Accotink Creek tributary in this area.
- Removed old paved roads that were no longer needed after the BRAC 2005 construction.

9.3.2.6 Conservation Education and Outreach

The installation's Special Natural Areas (primarily the refuges) and the ABWR Environmental Education Center have served many diverse educational and outreach functions for the installation.

Education

Educational activities have included the following:

- Hosting Earth Day events, including events with DA- and DoD-level involvement.
- Hosting a variety of interpretive programs (e.g., bird walks, fishing clinics, wildflower walks, wildlife presentations, etc.).
- Hosting a variety of hands-on conservation learning events, including fishing clinics.
- Providing presentations to Fort Belvoir (and off-post) school groups (e.g., Earth Day Programs, Environmental Career Day Programs, curricula in support of Standards of Learning (SOLs).
- Operating ABWR Environmental Education Center for drop-in and formal program events (now only by appointment only, as staffing and resources allow; previously was open on a seasonal basis).
- Providing programs to DFMWR events, include various summer camping and overnight camping events at the Tompkins Basin Recreational Area.
- Supporting Fort Belvoir in the Partners in Education program with several local off-post schools.
- Supporting native plant demonstration projects with groups such as the Fort Belvoir Girl Scouts and the Fort Belvoir Garden Club.
- Supporting several university class groups for field study and research projects (e.g., spring fish migration surveys, ground water seep surveys, botanical surveys) by several regional universities.
- Designing and fabricating educational displays for indoor and outdoor use
- Preparation of Fort Belvoir-specific conservation education materials, such as Fort Belvoir Bird List, Fort Belvoir "Plant and Animal Safety Concerns" briefing (Appendix M).
- Writing and publishing (e.g., in the Fort Belvoir Eagle) articles on natural resources and conservation topics for Fort Belvoir.
- Providing installation natural resources personnel as speakers to installation groups and events.

Outreach

Outreach events and activities have included the following:

- Hosting professional meetings, conferences and trainings, including the 2000 PIF Mid-Atlantic Coastal Plain Bird Conservation Plan Conference, bendway weir training, stream restoration training, low-impact development training, bat survey/acoustic monitoring training for regional DoD biologists etc.
- Including the ABWR and JMAWR trail systems on the published Virginia Coastal Birding Trail.
- Supporting various environmental events by outside entities (e.g., Fairfax County Earth Day, and other environmental celebrations, public release of a rehabilitated bald eagle, etc.).
- Supporting scouting organization events (e.g., troop service projects, Eagle Scout projects for trail infrastructure service, invasive species control (mechanical removal, only)).
- Hosting various publically accessible environmental service days, such as the annual National Public Lands Day events, annual Virginia Shoreline Clean-up Day, and annual Christmas Bird Count.
- Providing biological information and photographs for professional-level publications addressing natural resources in the Fort Belvoir area (e.g., several technical reports by DCR-NHP, articles for the Virginia Wildlife Magazine).

9.4 CONTINUING AND FUTURE SPECIAL NATURAL AREAS MANAGEMENT

Fort Belvoir intends to continue the management emphasis and actions addressed in Section 9.3. Fort Belvoir will continue to follow sound ecosystem management principles to conserve natural resources while maintaining no net loss of military training and testing capabilities. Fort Belvoir will continue to use "Special Natural Area" designation, in accordance with DODI 4715.03, to manage areas of the installation where resources warrant special conservation as consistent with military mission. Fort Belvoir will continue to consider such resources to include resources that have been assigned high conservation priority by statute or regulation (e.g., federal threatened species), resources previously identified as mitigation commitments under NEPA (e.g., the FWC), and resources with acknowledged regional ecological significance (e.g., extensive wetlands). Management will strive for no net loss of military training and testing capabilities. Fort Belvoir will continue to provide the public opportunities to access natural resources within the Special Natural Areas consistent with resource management goals, and with mission and operations and security requirements.

9.5 SPECIAL NATURAL AREAS MANAGEMENT GOALS, OBJECTIVES, AND STRATEGIES

9.5.1 Projects

Proposed activities that are considered Projects in this INRMP are activities that may potentially impact the environment and would need to be evaluated for the appropriate level of NEPA documentation. The following goals contain Projects within their objectives or strategies:

Goal 1: Continue to provide for conservation of significant natural resources, in balance with military mission and public access requirements.

- ***Objective***: Conserve areas of ecologically significant resources, consistent with DoD policy (DoDI 4715.03) for designating specific areas of the installation that warrant special conservation as "Special Natural Areas", consistant with military mission: ABWR, JMAWR, T-17 Refuge, FWC, and Accotink Creek Conservation Corridor.
- ***Strategy***:
  1) Maintain designation of these areas as environmentally constrained to development in the installation RPMP, and as warranting conservation consideration in other installation plans and documents.
  2) Designate new Special Natural Areas where legally obligated to do so.
  3) Maintain and communicate access/use policy for Special Natural Areas.
  4) Incorporate Special Natural Area boundaries, and supporting documentation, into the installation GIS, real property records, and installation natural resources databases.
  5) Install and maintain signage and markers identifying Special Natural Areas, and their boundaries, in the field.

Goal 2: Continue to obtain scientific information on natural resources through surveys and monitoring. Monitor natural resources within Special Natural Areas to evaluate the potential for enhancement, and to assess the presence and effect of stressors. Identify and execute actions for enhancement, or protection, as appropriate.

- ***Objective***: Prioritize Special Natural Areas on installation-wide efforts (e.g., rare species surveys [Section 8], bald eagle monitoring [Section 7], aquatic monitoring [Section 5] invasive and exotic species survey [Section 6], etc.)
- ***Strategy***: Obtain scientific information on items of management interest specific to natural resources/ecological functions of Special Natural Areas. Such work includes:
  1) Wildlife movement surveys within the FWC
  2) Wildlife use monitoring of existing wildlife crossing structures within the FWC

3) User surveys of the nature trail systems
4) Assessment of the natural resources and their specific conservation needs of the T-17 Refuge and the Accotink Creek Conservation Corridor, and prepare area-specific management plans, as needed. Data gaps exist for rare plant communities, wildlife movement, and migratory fish presence/passage in these area. There is a continuous need to monitor for invasive vegetation/pest species.

Goal 3: Continue to protect and enhance natural resources and habitats.

- ***Objective***: Manage access to, and use of, Special Natural Areas with emphasis on compatibility with natural resources conservation. Aim to keep access and use at levels that do not risk damage to the natural resources of management concern.
- ***Strategy***:
  1) Identify and execute projects in response to identified opportunities for natural resources enhancement, or in situations where stressors are adversely affecting resources of conservation priority.
  2) Projects could be executed under installation-wide programs (e.g., fish and wildlife management [Section 7]; endangered, threatened, or rare species management [Section 8]; vegetation management [Section 6]; water resources management [Section 5.3], wetlands management [Section 5.3] etc.). Prioritize Special Natural Areas work under these programs.
  3) Projects could also be executed as stand-alone actions, such as maintenance and repair of existing wildlife crossing structures, or projects to improve fish passage.

Goal 4: Continue to implement outreach for public access, and environmental awareness and education programs

- ***Objective***: Emphasize environmental education, scientific research and study; and low-intensity outdoor recreation and military training. Continue to discourage land disturbing activities, and other activities and events that may conflict with resource conservation.
- ***Strategy***:
  1) Maintain and communicate specific Special Natural Area access and use policies and restrictions. Execute through installation Policy Memos; area and trail pamphlets, and signage; and briefing documents.
  2) Require all requests for non-routine Special Natural Area access and use to be coordinated through DPW- Environmental Division for review and approval.
  3) Monitor Special Natural Area use, and evaluate effect on resource conservation. Consider altering use policies, if necessary, to protect resources.
  4) Develop and maintain hiking trail systems and associated access facilities in ABWR, JMAWR, and T-17 Refuge for low-intensity use.

5) Develop and maintain interpretive/conservation education displays in ABWR, JMAWR, and T-17 Refuge.
6) Maintain and staff the ABWR Environmental Education Center.
7) Develop and maintain environmental education materials, such as displays, handouts, and curricula.
8) Develop and maintain fishing structures and wildlife viewing structures.
9) Investigate a Partner in Education relationship with local schools.
10) Investigate partnering, or entering into Memoranda of Agreement/Cooperative Agreements with Universities or other educational institutions to support educational programs at the refuges.
11) Conduct educational events in/associated with the refuges, including events/programs at the ABWR Environmental Education Center.
12) Prepare natural resources articles for publication (e.g., in the Belvoir Eagle)
13) Investigate a Qualified Volunteer Program to provide such services as organized clean-up days, minor facilities maintenance, educational programs, etc.
14) Respond to requests for technical information, or presentations, from on-post and off-post entities
15) Investigate development and use of educational applications for cell phone and other mobile technologies.
16) Coordinate with natural resources staff associated with refuges, parks and other conservation properties in the region, as appropriate.

9.5.2 Actions

Actions are those activities that do not require ground breaking or environmentally altering activities. The following goals contain Actions within their objectives or strategies.

Goal 5: Continue to incorporate natural resources conservation goals into installation-wide actions.

- ***Objective***: Review all installation actions for potential impact to natural resources within Special Natural Areas. Identify and execute mitigation.
- ***Strategy***:
  1) Include Special Natural Areas considerations in all review processes (e.g., project planning, NEPA evaluation, engineering planset review, Excavation Permit Review, Annual Work Plan Development, etc.).
  2) Include Special Natural Areas considerations in all installation planning processes (e.g., real property master planning, small area planning, stationing, privatization planning, five-year utility maintenance and modernization planning, etc.).

3) Identify and execute actions to avoid, minimize, or off-set impacts of installation actions on ecologically significant natural resources.
4) Integrate Special Natural Areas management with other installation programs as Spill Response, Wildland Fire Management, and Cultural Resources Management, Military Munitions Response and Installation Restoration programs, MS4 and Industrial Stormwater Programs.
5) Integrate Special Natural Area management with installation operation and security requirements.
6) Upon request from DES, provide support to investigation and enforcement actions regarding violations of Federal and state natural resources laws and regulations.

Goal 6: Continue to maintain Special Natural Areas information so it is accessible to, and can be used by, installation natural resource managers.

- ***Objective***: Develop and implement a Special Natural Areas database.
- ***Strategy***:
  1) Develop a system for storing and managing Special Natural Areas information
  2) Enter electronic data
  3) Scan and upload paper records.

Goal 7: Continue to make information on the Special Natural Areas available.

- ***Objective***: Keep installation decision makers, and users of installation lands, informed of the Special Natural Areas
- ***Strategy***:
  1) Update the installation GIS to contain accurate Special Natural Areas boundaries, and supporting information.
  2) Maintain Special Natural Area boundaries and supporting information in installation plans, records and documents.

Goal 8: Continue to issue installation-specific policy and guidance documents.

- ***Objective***: Provide direction and guidance for projects which may impact Special Natural Areas
- ***Strategy***: Develop and maintain a policy memorandum regarding Special Natural Areas, and update refuge and trails brochures.

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10.0 RECREATIONAL OPPORTUNITIES

Fort Belvoir provides numerous recreational opportunities whether consumptive or non-consumptive in accordance with the Sikes Act. Opportunities can be found in various publically accessible installation areas such as Tompkins Basin. Activities such as hunting take place in areas off limits to the public through authorized use only. Fort Belvoir's location also provides miles of shoreline accessible by foot or watercraft. Consumptive and non-consumptive recreation rules and procedures as well as permits (in accordance with the Sikes Act) are found in the Fort Belvoir Watercraft Recreation, Hunting, and Fishing Policy #75 (Appendix C). Recreation access is controlled and monitored through the use of iSportsman, a software program that allows for the control of recreational access on the installation.

10.1 CONSUMPTIVE OPPORTUNITIES

10.1.1 Hunting

The current relationship between wildlife management and recreational hunting maximizes hunter opportunity to reduce overabundant deer and Canada goose populations. Liberal seasons and harvest limits that allow the use of archery equipment (deer) and firearms (Canada geese) are selected to reduce the populations of both. Hunting is an effective management tool to achieve population levels that are most beneficial to a given species (e.g., populations that minimize the potential for disease problems), and that do not adversely affect other species or their habitats. The Fort Belvoir hunting program is not intended to introduce or increase populations of game species. Fort Belvoir maintains a Fish and Wildlife Conservation Fund, in accordance with the Sikes Act, which allows installations to establish fees for hunting, fishing, or trapping. The fees must be used for fish and wildlife related expenses on the installation such as protection, conservation, and management of fish and wildlife, including habitat improvement and related activities. DoDI 4715.03, enclosure 3(6)(c)(3) requires and installation to use the same fee schedule for all participants, with the exception of senior citizens, children, and the disabled. Information (rules, regulations, maps, etc.) regarding the Fort Belvoir hunting program can be located on the Fort Belvoir iSportsman (www.fbisportsman.net) and Fort Belvoir DFMWR-Outdoor Recreation (www.belvoir.armymwr.com/categories/outdoor-recreation websites.

10.1.2 Bowhunting

Fort Belvoir's bowhunting program has existed since the early 1980's. Bowhunters are required to have all necessary state hunting permits (which require a hunter's safety course to obtain), attend an International Bowhunting

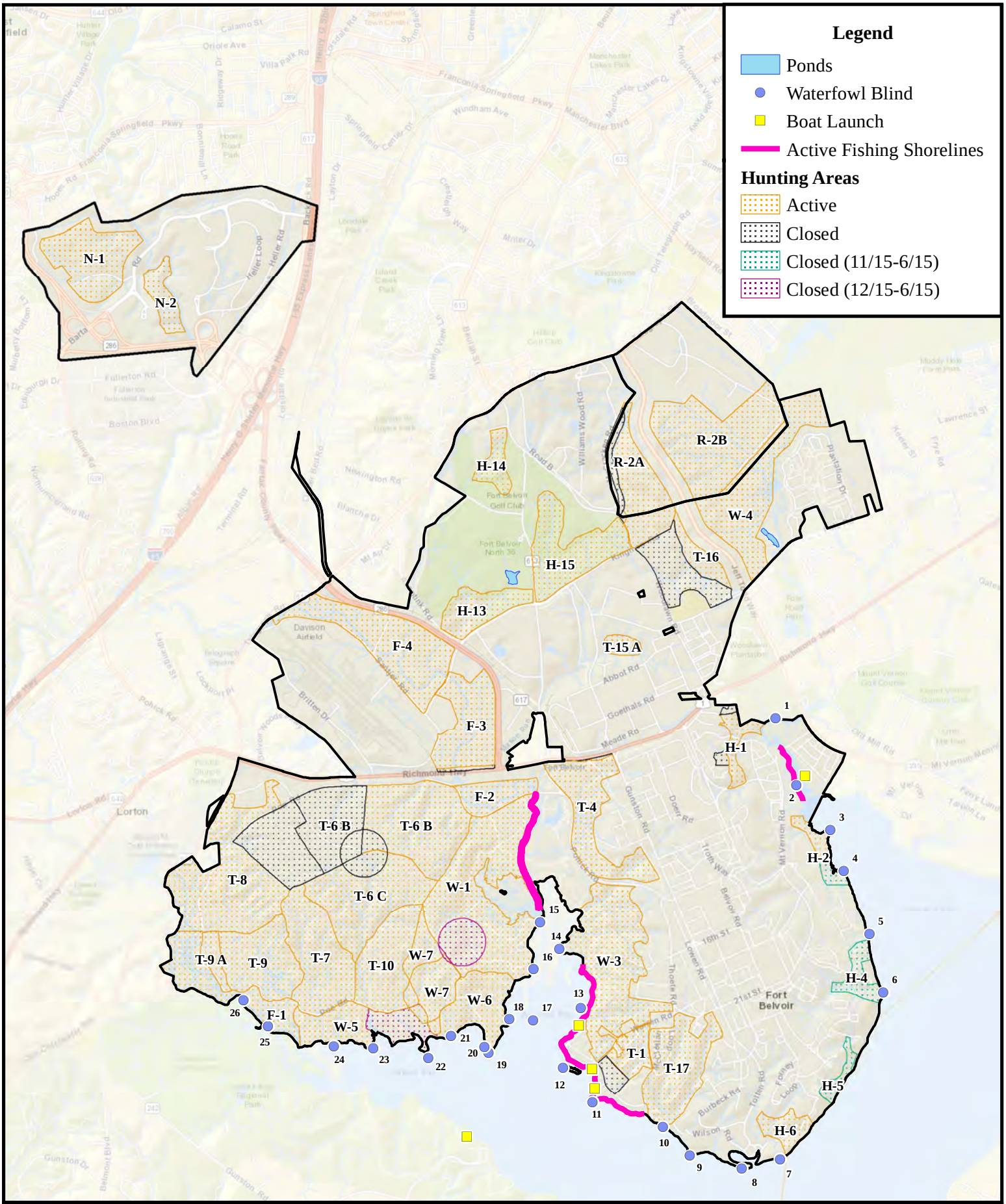
Education Program (IBEP), and pass a qualification test. The qualification test requires a bowhunter to place two out of three arrows (with broadheads) inside a nine inch circle at distances of 20 and 30 yards. Equipment is limited to recurve, longbow, compound bow, and crossbow (with doctor's approval). The use of crossbows is permitted in Virginia; however, use by all customers is currently under consideration by installation staff. Fort Belvoir allows the bowhunting of white-tailed deer, wild turkey, and other species that are in season and in accordance with VDGIF laws and regulations.

10.1.2.1 White-tailed Deer

Fort Belvoir's most popular game species is the white-tailed deer. The Fort Belvoir deer hunting program has existed for several decades with population, access, and harvest data dating back to the early 1980's. Hunters harvested a record 250 deer in 1998 when population levels were at an all-time high. Since the inception of a nationally recognized hunting program, liberal harvest limits (unlimited daily antlerless harvest), and seasons that occur from early September through the end of March, declines in population and harvest have occurred. The installation is divided into 34 hunting areas (Figure 10.1) as determined by training areas, roadways, and geographical features. These 34 areas accommodate 134 total hunting slots available to the public. Some areas, because of their proximity to major roadways and on-base housing, require hunters to use elevated tree stands only. Fort Belvoir participates in the VDGIF Deer Management Assistance Program (DMAP) program, which requires hunters to provide weight, sex, antler measurements, and health information, as well as removal of a jawbone for submission to DPW- Environmental Division for age determination. This data is then submitted by DPW- Environmental Division to VDGIF and a yearly report is provided by VDGIF to DPW- Environmental Division in order to assess overall herd health and make recommendations if necessary. Current data suggest a relatively healthy, stable, and balanced herd when compared regionally.

10.1.2.2 Wild Turkey

Fort Belvoir's second most popular game species is the eastern wild turkey. Fort Belvoir established a wild turkey season in 2000, for recreational purposes only. Current seasons and harvest limits (spring and fall) are based upon seasons/harvest limits set forth by VDGIF. Wild turkey can only be hunted by means of bowhunting; no firearms are permitted. The use of bowhunting equipment has limited the harvest of wild turkey, with no more than seven males (spring gobblers) harvested in the spring, and seldom more than one turkey (male or female) harvested in the fall. There are currently five zones (Figure 10.2) that make up the spring turkey season, accommodating 20 hunters and a maximum of 40 hunters if hunting in pairs. Hunters are required to provide the sex, weight, spur length, and beard length (if applicable) to DPW- Environmental Division.



CONSUMPTIVE OUTDOOR RECREATION ON FORT BELVOIR

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Figure 10.1

Source: Fort Belvoir GIS, Google road maps

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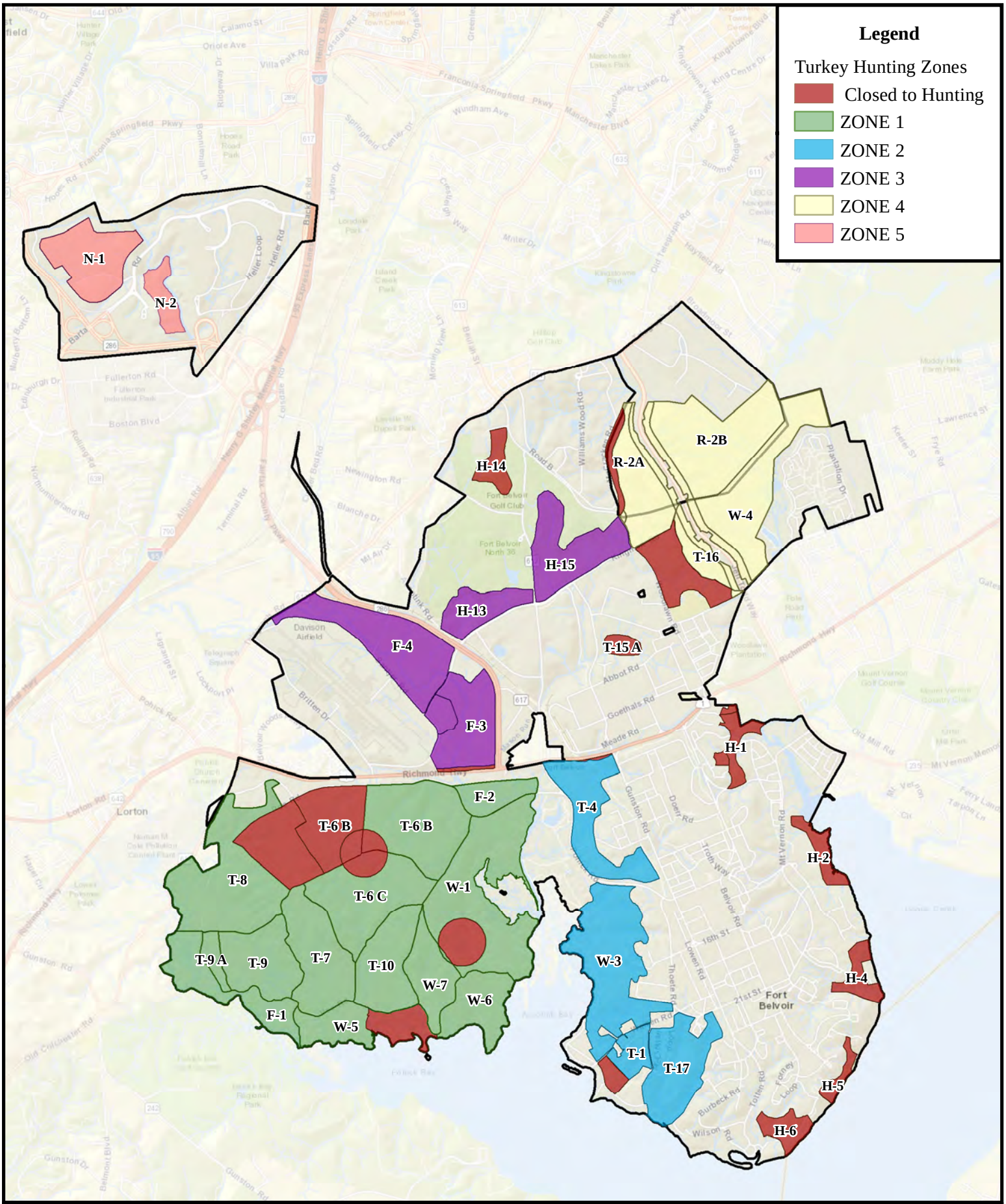

TURKEY HUNTING ZONES ON FORT BELVOIR

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Figure 10.2

Source: Fort Belvoir GIS, Google road maps

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10.1.2.3 Waterfowl

Fort Belvoir established a waterfowl season in 2006 for recreational purposes only; however, its continuation as a management tool for Canada geese is imperative. Seasons are established by the USFWS and VDGIF annually, starting with early-resident Canada goose (September) followed by various seasons from the end of September (teal), October-January (all approved waterfowl), and February (late Canada goose). The waterfowl hunting program allows the use of firearms, and takes place along the shorelines of Fort Belvoir, where three zones are established (Dogue/Potomac, Accotink Bay/Gunston Cove, Pohick Bay). These zones were established through recommendations by the USFWS and VDGIF to accommodate bald eagles (resting, foraging, and nesting areas), and waterfowl (resting/foraging areas), and have proven to be essential. These zones are utilized for hunting on a rotational basis and schedule as established by DPW- Environmental Division. Waterfowl hunting is closed two days per week to offset the opening of all three zones on Saturday to maximize opportunity and participation by hunters. Waterfowl and bald eagle habits are monitored daily to determine if changes in blind/zone schedules are necessary. A total of 26 blinds (25 stationary and one boat pull-in) are established and accommodate a maximum of 104 hunters (4 per blind). Hunters are required to provide the total number of ducks/geese harvested by species, as well as report any waterfowl containing leg-bands to DPW- Environmental Division. The most abundant waterfowl species harvested are Canada geese, mallard duck (*Anas platyrhynchos*), lesser scaup (*Aythya affinis*), and bufflehead (*Bucephala islandica*).

10.1.2.4 Fishing

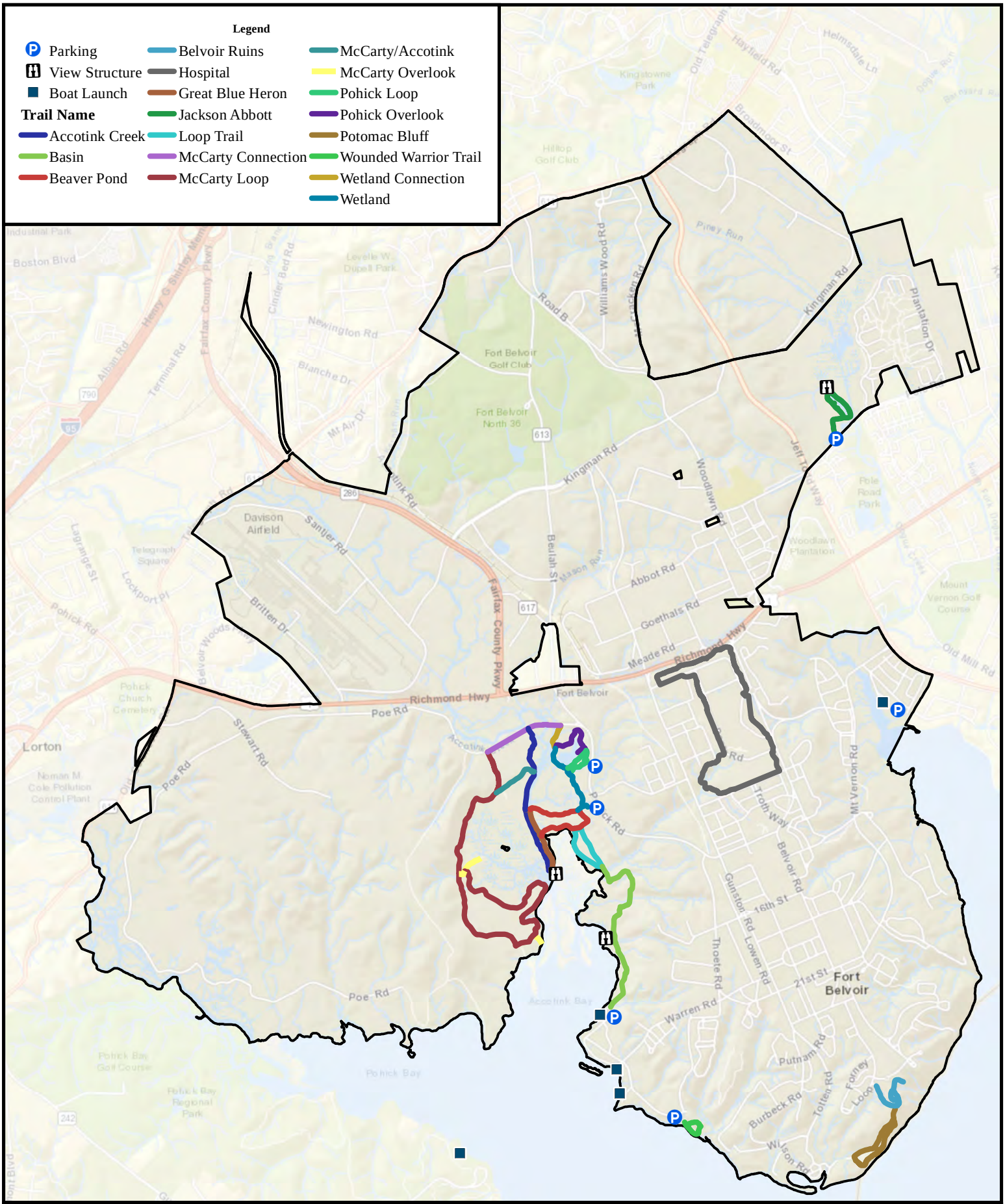
Fishing opportunities abound at Fort Belvoir, and require a Virginia state permit and a soon to-be-established Fort Belvoir fishing permit. Fishing is permitted at two ponds (Section 7.0), 3 streams (Dogue, Accotink, and Pohick Creeks), Potomac River, and Tompkins Basin. Shoreline access (walk-in) is limited to the two ponds, Tompkins Basin, and various locations along Accotink Bay, Accotink Creek, Gunston Cove, and Dogue Creeks. For those interested in fishing Accotink Bay and Creek, north of Tompkins Basin, access is permitted by using the various trail systems. Fishing is not permitted on Accotink Creek from the Poe Road Bridge north to Telegraph Road, and within the boundaries of FBNA. Shoreline access is not available to Pohick Bay or Pohick Creek, as well as Potomac River, access is only possible by watercraft. Non-motorized watercraft (kayak, canoe, car-top boat, etc.), as well as watercraft powered by electric motors, can be launched at three locations in Tompkins Basin (see Figure 10.1). Motorized watercraft (gas) can be launched at Fort Belvoir's Dogue Creek Marina or from various off-post marinas.

Two fishing piers at Tompkins Basin, and three at Mulligan Pond (see Figure 10.1), offer access to the general public and also accommodates those with

disabilities. Various fishing tackle and baits as well as canoe/kayak rentals are available in Tompkins Basin at Building 778- DFMWR Outdoor Recreation.

10.2 NON-CONSUMPTIVE OPPORTUNITIES

Fort Belvoir offers numerous locations for non-consumptive recreational activities (Figure 10.3). The ABWR contains approximately 14 miles of trail systems that can be utilized for such activities as bird watching, photography, and hiking. The trail system contains two wildlife viewing structures, one at the end of the Basin Trail Overlook and one at the end of the Great Blue Heron Trail. These structures offer views of Accotink Bay where waterfowl, shorebirds, and raptors can be seen. These same opportunities exist at the JMAWR where a viewing platform overlooks the wetlands. For more information on these areas see the Special Natural Areas Section (Section 9).



NON-CONSUMPTIVE OUTDOOR RECREATION

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Figure 10.3

Source: Fort Belvoir GIS, Google road maps

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11.0 INTEGRATED PEST MANAGEMENT

In accordance with DoD Instruction 4150.07, DoD Pest Management Program and AR 200-1, Fort Belvoir operates under an Integrated Pest Management Program (IPMP). Fort Belvoir's IPMP is carried out by a designated Installation Pest Management Coordinator (IPMC) under the "Fort Belvoir Integrated Pest Management Plan" (Appendix D). Installation-specific IPMP policy is contained in Fort Belvoir Policy Memorandum #32, *Fort Belvoir Integrated Pest Management* (Appendix C). A new IPMC designation is done upon change of command or change in IPM personnel. The IPMP Policy Memorandum is reviewed annually and revised as needed.

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12.0 BIRD/WILDLIFE STRIKE HAZARD MANAGEMENT

The Fort Belvoir Wildlife Hazard Management Plan (WHMP) for Davison Army Airfield (DAAF) (Appendix G) was established in June of 2015. The purpose of the plan is to minimize the potential of a bird/wildlife strike to aircraft, using an integrated approach of techniques and entities. The WHMP establishes a Wildlife Working Group (WWG) comprised of installation and airfield staff, and designates responsibilities to its members. It also establishes procedures for reporting hazardous bird/wildlife activity in and around DAAF and altering or discontinuing flying operations. Procedures are established to identify these hazards and to aid supervisors and aircrews in disseminating information, issuing alerts, and altering or discontinuing flying operations when required. To reduce hazards, the WHMP also establishes active and passive techniques to disperse birds/wildlife from the airfield as well as decreasing the attractiveness of the airfield to birds/wildlife.

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13.0 WILDLAND FIRE MANAGEMENT

In accordance with DoDI 4715.03, which states that "all DoD Components shall manage fuel loads, and provide adequate planning for wildland fire management," and AR 200-1, which states that "installations with unimproved grounds that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool will develop and implement an Integrated Wildland Fire Management Plan (IWFMP) that is compliant and integral with the INRMP," Fort Belvoir DPW and Fort Belvoir DES have developed an IWFMP (Appendix D). The plan establishes roles and responsibilities, procedures, and requirements for planning and controlling wildland fires on Fort Belvoir. It contains installation- specific information on interagency cooperation, cultural resource considerations, the history of the installation's wildland fires, and wildland firefighting equipment. The Department of the Army Wildland Fire Policy Guidance (U.S. Army, 2002) requires that the IWFMP be reviewed annually and revised at least once every five years.

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14.0 CONSERVATION LAW ENFORCEMENT

Fort Belvoir has federal exclusive jurisdiction over its natural resources. Federal and state Natural Resources law enforcement on the installation can only be performed by enforcement officers with federal commission. The Garrison Commander has authority to enforce federal and state (assimilated) law on the installation. A 2006 Memorandum of Agreement between the U.S. Department of the Interior, U.S. Fish and Wildlife Service, and Fort Belvoir delegates authority to the installation to enforce federal laws dealing with the protection and conservation of fish, wildlife, cultural, and natural resources (e.g., Migratory Bird Treaty Act, Endangered Species Act, etc.) (Appendix N). Fort Belvoir DES has the responsibility for conservation law enforcement on post.

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15.0 INSTALLATION RESILIENCY

Fort Belvoir has prepared this section based on the DoD Directive 4715.21, Climate Change Adaptation and Resilience. Fort Belvoir has also collected and reviewed as many documents as possible and has found that the following factors should be monitored regarding Climate Change/Mission Resiliency:

- **Wildland Fire**: With the prediction of longer, hotter, and drier summers, wildland fire is an increasing threat to the Mission. Fort Belvoir has prepared a Wildland Fire Management Plan to prepare for these potential impacts see Appendix D.
- **Invasive Species:** Fort Belvoir has a management plan to control invasive species and is actively treating select installation areas each year (Section 6 and Appendix D). In addition, staff members are watching for new invasive species that may be spreading into the region as reported by local, regional and state partners.
- **Endangered and Threatened Species**: Fort Belvoir is actively surveying for and managing listed endangered and threatened species with state and federal partners as found in Section 8. In addition, Fort Belvoir actively monitors and participates in the National Listing Workplan with state and federal partners.
- **Migratory Birds Nesting**: With the prediction of longer, hotter, and drier summers migratory birds may nest earlier, as Fort Belvoir has observed in 2017 with Common Grackles. The potential for birds nesting earlier will need to be continually monitored, so Fort Belvoir remains alert to these changing conditions and avoids mission impacts. (see *Fort Belvoir Conservation of Migratory Birds Policy Memorandum*, in Appendix C.)
- **Severe Weather**: With the global annual sea level rise estimated at three millimeters a year, Fort Belvoir does not foresee an issue over the next five to fifteen years but this needs to be monitored and noted for future development and training needs. Installation Resiliency incorporates the conservation of habitat in the face of climate-related threats, such as severe weather and sea level rise. As described in the Fort Belvoir Severe Weather Vulnerability Operations Order (Appendix O), Fort Belvoir is preparing to face an increase in number and magnitude of storm surge, flooding, and wind events. Estimated projections show potential impacts to 667 acres, approximately 8% of the installation, if sea levels rise 12 feet. This would impact resources such as piers and waterfront services, transportation infrastructure and routes, natural resources, historic and cultural resources, and housing.

As part of a severe weather vulnerabilities assessment, Fort Belvoir identified the following short-term and long-term actions:

- Short term: closing access to flooded areas to allow for natural drainage, coordinating with the private utility companies to ensure services continue.
- Long-term: consideration for flood hazard risks in land use planning, widening US Route 1 which raised the roadway and bridges.

Fort Belvoir plans to work with local, regional, state, and federal partners to monitor factors indicative of climate change in order to avoid mission impact.

16.0 IMPLEMENTATION

All requirements set forth in this INRMP requiring the expenditure of Fort Belvoir's funds are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 USC Section 1341). No obligation undertaken by Fort Belvoir under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose. This INRMP continues the management philosophy, as well as the program management goals, objectives and strategies from the previous INRMP (U.S. Army, 2001). As such, there has not been a major change to the installation's natural resources management program between the 2001 INRMP and this INRMP

16.1 COMPONENT PLANS

Each INRMP section that describes the day-to-day and long-term operational perspectives of a natural resources management program area (e.g., Fish and Wildlife Management; Rare, Threatened and Endangered Species Management) on Fort Belvoir represents a Component Plan. Each Component Plan is implemented through program-specific goals, objectives, and strategies to meet the overarching natural resources management requirement to protect and enhance natural resources for mission support, biodiversity conservation, and maintenance of ecosystem services, with no net loss of military training and testing capabilities.

16.2 NATURAL RESOURCES MANAGEMENT BUDGETING

The INRMP provides long-term natural resources management direction in the form of scheduled practices (recurring and non-recurring projects and supporting actions) that are incorporated into annual budget proposals. Funds are allocated annually based on budget proposals and congressional intent. Management goals and objectives are long-term. Projects and supporting actions may occur on an annual basis or may occur at specific times. They may have short (5 year or less) or long (up to 15 year) timeframes. To fully implement the goals, objectives, and strategies of the INRMP, annual budgets are programmed into the Army's Conservation Budgets and Conservation Program Objective Memorandum. U.S. Army Headquarters policies and guidance resources direct installation level conservation programming and budgeting. Fort Belvoir shall implement this INRMP subject to the availability of funding.

16.3 NATURAL RESOURCES MANAGEMENT STAFFING

To successfully implement the INRMP, a combination of government staff persons, contract labor, and partners (including volunteers) is required. In addition to the six government natural resources staff persons within Fort Belvoir Division, execution of Fort Belvoir's natural resources management program currently uses approximately six person-years of contractor services. Other person-years of support are provided by other installation organizations (e.g., NAF, DES conservation law enforcement personnel), other government agencies (e.g., MIPR to fund other agency staff or interns for natural resources management program work), and by partners and volunteers. The Fort Belvoir Environmental Division Chief is responsible for enforcing compliance with the INRMP.

16.4 ANNUAL REVIEW AND COORDINATION

Natural resources management is a dynamic process, and as such, management plans often require frequent reviews and updates. Following completion of the INRMP, Fort Belvoir's Conservation Branch Chief will do periodic reviews and updates to account for changes in the military mission, changes to natural resources or ecosystem conditions, or changes to the regulatory requirements or policies. The Conservation Branch Chief, in coordination with USFWS and VDGIF staff, will do an annual review for INRMP implementation and effectiveness. The results of this review will be provided to Fort Belvoir senior leadership, and will be incorporated into the INRMP, as appropriate. Informational changes and minor modifications to implementation strategies may be included as annotations or edits to the INRMP.

16.5 DOCUMENTATION OF INRMP IMPLEMENTATION

The results of the Annual Review cycle will be maintained as part of the administrative record for Sikes Act implementation.

16.6 NATURAL RESOURCES MANAGEMENT WORK PLAN

Subject to the availability of funds, the following projects and supporting actions are identified for the Natural Resources Management Program at Fort Belvoir:

16.6.1 Annual Projects and Actions

Tables 16-2 through 16-6 refer to projects and actions that are completed by the installation staff and contractors on an annual basis.

16.6.1.1 Water Resources Projects and Actions

Table 16-1: Water Resources Tasks Performed Annually	
Project/Action	**Description**
Maintain water resources information in installation documents and databases	Maintain and update baseline information. Include in RPMPs, Small Area Plans, real property records, etc. as appropriate. Review, verify and update information in the GIS. Field verify wetland and RPA PLS boundaries, as needed.
Perform year-round surveillance of water resources	Review existing conditions in the field. Address wetlands, streams and ponds. Include fish and benthic communities. Evaluate presence and effect of stressors (e.g., invasive plants, excessive stormwater flows, ground disturbance) and propose action, as appropriate. Select representative sample to survey each year.
Review ongoing and proposed installation actions for potential to impact water resources	Assess water resources in planning actions (e.g., real property master planning, small area planning, stationing, real estate actions, privatization, siting, etc.); NEPA evaluations and mitigations; engineering planset development and review; environmental permitting; environmental restorations; military testing and training; operations and maintenance; excavation and demolition permitting; work order review; and all other installation project and activity review processes. Advise on strategies to avoid/minimize impact, and on regulatory compliance requirements, as appropriate.
Identify possible projects/actions to conserve/enhance water resources	Identify opportunities for stream restoration, riparian buffer restoration/enhancement, wetland restoration/enhancement, aquatic habitat, etc.

Table 16-1: Water Resources Tasks Performed Annually	
Project/Action	**Description**
Identify and conserve ecologically significant water resources	Continue to consider ecologically significant water resources as resources warranting special conservation efforts and designation as "Special Natural Areas" under DoDI 4715.03. Maintain existing Special Natural Area boundaries. Designate new Special Natural Areas where there is a legal requirement to do so.
Evaluate water resources in support of military mission	Perform localized/activity-specific water resources studies/monitoring/evaluations in support of ongoing or proposed mission activities. Identify and provide advice regarding regulatory compliance requirements, as well as for resource conservation.
Incorporate conservation projects/actions into operations and maintenance	Identify and incorporate water resource conservation initiatives into operations and maintenance work (e.g., re-planting/enhancing native vegetation in disturbed riparian/shoreline areas; clearing debris from culverts, etc.)
Identify and manage regulatory compliance actions	Develop and submit wetland permit applications. Monitor for permit compliance. Maintain records. Coordinate with regulatory agencies (e.g., USACE, VDEQ, VMRC), and prepare and submit reports as required. Advise, prepare corrective action plans, and report to regulatory agencies on permitted and unpermitted actions where corrective actions are required. Identify and recommend impact mitigation, and monitor and report to regulatory agencies on mitigation implementation.
Coordinate with regulatory and stewardship agencies and entities	Maintain regular professional coordination with regulatory agencies (e.g., USACE, VDEQ, VMRC) and stewardship agencies (e.g., DCR-NHP, Chesapeake Bay Program Office, Northern Virginia Soil and Water Conservation District). Include discussion of partnerships and cooperation on regional stewardship initiatives, as appropriate.
Prepare and maintain policies and guidance documents	Review and revise existing written policy and guidance documents on water resources (e.g., wetland permit process guidance for Fort Belvoir). Evaluate the need for additional Fort Belvoir-specific policy and guidance documents on wetlands, streams, riparian areas, etc. Prepare policy memorandum on riparian buffers.
Support emergency situations	Provide technical assistance to emergency situations, such as fuel spills, that could threaten water resources.

Table 16-1: Water Resources Tasks Performed Annually	
Project/Action	**Description**
Support regulatory compliance and enforcement	Perform compliance inspections to address federal and state laws and regulations, as applicable to Fort Belvoir, and DoD, DA and Fort Belvoir policies on water resources. Enforce federal and state water resources laws and regulations, applicable to Fort Belvoir, as well as DoD, DA and Fort Belvoir water resources policies.
Evaluate water resources conditions	Perform an annual survey of a representative sample of installation water resources (including streams, wetlands, ponds and riparian areas) to evaluate the effectiveness/success of management actions (including mitigations and corrective actions).
Provide education and training on water resources	Identify and provide opportunities for specialized training in water resources management/conservation for garrison, partner, tenant, and contractor staff, as appropriate.
Publish educational information on water resources	Write and publish articles for the Fort Belvoir website, Fort Belvoir newspaper (Belvoir Eagle), DoD Chesapeake Bay program publications, etc., as appropriate. Continue to respond to requests for information from on-post and off-post entities, as appropriate.
Provide technical information on water resources	Respond to requests from on-post and off-post entities, as appropriate. Manage water resources information to be accessible to installation natural resources managers, and other personnel, as appropriate.
Support public outreach	Participate in educational and service events/projects, as appropriate.

16.6.1.2 Vegetation Annual Projects and Actions

Table 16-2: Vegetation Management Tasks Performed Annually	
Project/Action	**Description**
Maintain vegetation resource information in	Maintain and update baseline information. Include in RPMPs, small area plans, real property records, etc., as appropriate. Review, verify and update information in the GIS. Field verify vegetation communities, forest inventories, etc., as needed.

Table 16-2: Vegetation Management Tasks Performed Annually	
Project/Action	**Description**
installation documents and databases	
Perform year-round surveillance of vegetation conditions (developed and undeveloped installation areas)	Review existing conditions in the field. Address vegetation communities, forest, urban forest, etc. Evaluate presence and effect of stressors (e.g., invasive vegetation, forest pests, disease, land disturbance, etc.) and propose action, as appropriate.
Review ongoing and proposed installation actions for potential to impact vegetation resources	Assess vegetation resources in planning actions (e.g., real property master planning, small area planning, stationing, real estate actions, privatization, siting, etc.); NEPA evaluations and mitigations; engineering planset development and review; environmental permitting; environmental restorations; military testing and training; operations and maintenance; excavation and demolition permitting; work order review; and, all other installation project and activity review processes. Advise on strategies to avoid/minimize impact, and on regulatory compliance requirements, as appropriate.
Identify possible projects/actions to conserve/enhance vegetation resources	Identify opportunities for replanting/reforesting (e.g., disturbed areas in FWC, riparian areas, shoreline, etc.). Incorporate into annual funding requests, annual work plans, mitigation planning, etc., as practicable.
Identify and conserve areas of ecologically significant vegetation resources	Continue to consider ecologically significant vegetation resources as resources warranting special conservation efforts and designation as “Special Natural Areas” under DoDI 4715.03. Maintain existing Special Natural Area boundaries. Designate new Special Natural Areas where there is a legal requirement to do so.
Evaluate vegetation resources in support of military mission	Perform localized/activity-specific vegetation studies/monitoring/evaluations in support of ongoing or proposed mission activities. Identify and provide advice regarding regulatory compliance requirements, as well as for resource conservation.

Table 16-2: Vegetation Management Tasks Performed Annually	
Project/Action	**Description**
Incorporate conservation projects/actions into operations and maintenance	Identify and incorporate projects into operations and maintenance work (e.g., replanting/enhancing vegetation in FWC, in riparian areas, and along shoreline, etc.), using conservation landscaping practices, controlling invasive vegetation, etc.)
Identify and manage regulatory compliance (nutrient management)	Develop and implement Nutrient Management Plans where required (e.g., golf course). Monitor for plan implementation. Keep records. Submit reports to the regulatory agency, as required.
Coordinate with regulatory and stewardship agencies and entities	Maintain regular professional coordination with regulatory agencies (e.g., DCR) and stewardship agencies. Include discussion of partnerships/cooperation on regional stewardship initiatives, as appropriate.
Prepare and maintain polices and guidance on vegetation resources	Review and revise existing written policy and guidance (e.g., Fort Belvoir *Tree Removal and Protection Policy* Memorandum, recommended seed mixes, recommended planting list, etc.) Evaluate the need for any additional Fort Belvoir-specific policy or guidance documents.
Support emergency situations	Provide technical assistance to emergency situations, such as wildland fire, that could threaten vegetation resources.
Support regulatory enforcement	Perform compliance inspections to address federal and state laws and regulations, as applicable to Fort Belvoir, and DoD, DA and Fort Belvoir policies on vegetation management. Enforce federal and state laws and regulations, as applicable to Fort Belvoir, as well as DoD, DA and Fort Belvoir policies on vegetation management.
Evaluate vegetation conditions	Perform an annual survey of a representative sample of installation area (including urban landscapes, riparian areas and undeveloped areas) to evaluate the effectiveness/success of management and mitigation and corrective actions.
Implement the integrated pest management program	Implement the Fort Belvoir integrated pest management program (e.g., invasive vegetation control, forest pest control, etc.). Maintain and implement the Integrated Pest Management Plan, and associated policy and guidance documents.

Table 16-2: Vegetation Management Tasks Performed Annually	
Project/Action	**Description**
Provide education and training on vegetation resources	Identify and provide opportunities for specialized training for garrison, partner, tenant, and contractor staff, as appropriate.
Publish educational information on vegetation resources	Write and publish articles on the Fort Belvoir website, Fort Belvoir newspaper (Belvoir Eagle), DoD Chesapeake Bay program publications, etc., as appropriate.
Provide technical information on vegetation resources	Respond to requests from on-post and off-post entities, as appropriate. Manage vegetation information to be accessible to installation natural resource managers, and to other personnel, as appropriate.
Support public outreach	Participate in educational and service events/projects, as appropriate.
Prepare and oversee execution of annual tree care work plans	Continue to execute hazard tree surveys to identify and prioritize removal of trees that pose potential threats to people, property or operations. Monitor urban trees for condition, and identify and prioritize work. Address pruning needs, as well mulching, cabling, root treatment, etc. Develop and oversee implementation of annual tree planting plans, including planting follow-up actions such as surveys of planting survival, tree tube/tree stake removals, etc.).
Provide technical guidance to landscape design and maintenance	Provide guidance (e.g., recommended plant species, planting designs, etc.) for, and review of, landscape plans.
Provide technical guidance to mowing	Provide guidance on mowing strategies/locations. Identify locations where mowing is unnecessary and can be reduced. Incorporate wildlife considerations into mowing strategies in semi-improved installation areas.
Provide guidance to pest control	Inspect vegetation for pests and advise on treatment. Monitor effectiveness of treatment.
Control invasive vegetation	Survey/monitor areas for presence/effect of invasive vegetation, and advise on control. Monitor effectiveness of control.

Table 16-2: Vegetation Management Tasks Performed Annually	
Project/Action	**Description**
Replace trees lost to construction, in accordance with Fort Belvoir *Tree Removal and Protection Policy* memorandum	Mitigate for trees lost to construction, by re-planting trees at a 2:1 basis, or where not possible, following the alternative mitigation strategies specified in the Fort Belvoir *Tree Removal and Protection Policy* memorandum.

16.6.1.3 Fish and Wildlife Annual Projects and Actions

Table 16-3: Fish & Wildlife Tasks Performed Annually	
Project/Action	**Description**
Maintain fish and wildlife information in installation documents and databases	Maintain and update baseline information. Include in RPMPs, small area plans, real property records, etc., as appropriate. Review, verify and update information in the GIS. Field verify fish and wildlife information (e.g., habitat, restoration/enhancement projects, mitigation projects, etc.), as needed.
Perform year-round surveillance of fish and wildlife conditions	Review existing conditions in the field. Evaluate presence and effect of stressors (e.g., invasive vegetation, land disturbance, impediments to fish passage, deer browse, etc.) and propose action, as appropriate.
Review on-going and proposed installation actions for potential to impact fish and wildlife	Assess vegetation resources for habitat value in planning actions (e.g., real property master planning, small area planning, stationing, real estate actions, privatization, siting, etc.); NEPA evaluations and mitigations; engineering planset development and review; environmental permitting; environmental restorations; military testing and training; operations and maintenance; excavation and demolition permitting; work order review; and, all other installation project and activity review processes. Advise on strategies to avoid/minimize impact, and on regulatory compliance requirements, as appropriate.
Identify possible projects/actions to	Identify opportunities for improving fish and wildlife habitat (e.g., replanting disturbed areas in FWC, selective clear cutting or mowing semi-improved grounds to manipulate habitats, etc.). Incorporate conservation strategies into installation

Table 16-3: Fish & Wildlife Tasks Performed Annually	
Project/Action	**Description**
conserve/enhance fish and wildlife resources	operations and maintenance activities (e.g., reduced and seasonal restrictions on mowing, using wildlife seed mixes in replanting disturbed areas, eliminating excess impervious area, etc.).
Identify and conserve habitat for fish and wildlife of high conservation priority	Continue to consider ecologically significant fish and wildlife resources as resources warranting special conservation efforts and designation as "Special Natural Areas" under DoDI 4715.03. Maintain existing Special Natural Area boundaries. Designate new Special Natural Areas where there is a legal requirement to do so.
Identify and conserve habitat for bald eagles	Include bald eagle nesting, roosting, and foraging habitat in the designated "shoreline buffer" and "nest buffer"management areas on post. Manage these areas to avoid impacting habitat, or eagles.
Identify and correct hazards to wildlife	Identify situations that pose potential hazard to wildlife (e.g., electrocution hazards, fences, windows, lighting, etc.) and advise on actions to eliminate/reduce the hazard. Address existing as well as proposed facilities.
Identify and correct impediments to fish passage	Identify fish passage blockages (e.g., excessive sedimentation at culverts) and advise on actions to eliminate/reduce the impediment.
Identify and manage regulatory compliance	Maintain VDGIF permits (Scientific Collector, Salvage, Display). Inform and enforce hunting and fishing regulations. Advise on actions for compliance with Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, etc.
Coordinate with regulatory and stewardship agencies and entities	Maintain regular professional coordination with regulatory agencies (e.g., USFWS, VDGIF) and stewardship agencies (e.g., (DCR-NHP). Include discussion of partnerships and cooperation on regional stewardship initiatives, as appropriate.
Prepare and maintain policy and guidance documents	Review and revise existing written policy and guidance documents (e.g., *Watercraft Recreation, Hunting and Fishing Policy*; *Conservation of Migratory Birds Policy*, etc.). Evaluate the need for additional Fort Belvoir-specific policies on fish and wildlife.
Evaluate fish and wildlife resources in support of mission	Perform localized/activity-specific evaluations in support of ongoing or proposed mission activities. Identify and provide advice regarding regulatory compliance requirements, as well as for resource conservation.

Table 16-3: Fish & Wildlife Tasks Performed Annually	
Project/Action	**Description**
Support emergency situations	Provide technical assistance to emergency situations, such as injured wildlife.
Support bird/wildlife hazard management at DAAF	Maintain the DAAF WHMP. Perform assigned functions as a member of Wildlife Working Group.
Support the integrated pest management program	Support the integrated pest management program, particularly the components pertaining to problematic wildlife and feral pets.
Evaluate/advise on situations of wildlife conflict with mission/installation operations	Survey, evaluate and advise on situations where wildlife pose a risk to mission/facilities (e.g., beaver blockages of culverts).
Support regulatory enforcement	Perform compliance inspections to address federal and state fish and wildlife laws applicable to Fort Belvoir, and DoD, DA and Fort Belvoir policies on fish and wildlife. Support enforcement of federal and state fish and wildlife laws and regulations applicable to Fort Belvoir, as well as DoD, DA and Fort Belvoir policies.
Evaluate fish and wildlife resources	Perform an annual survey of a representative sample of habitat areas to evaluate the effectiveness/success of management and mitigation and corrective actions.
Provide education and training on fish and wildlife	Identify and provide opportunities for specialized training for garrison, partner, tenant, and contractor staff, as appropriate.
Publish educational information on fish and wildlife	Prepare and publish articles on the Fort Belvoir website, newspaper (Belvoir Eagle), DoD natural resources management program publications, as appropriate.
Provide technical information on fish and wildlife	Respond to requests from on-post and off-post entities, as appropriate. Manage fish and wildlife information to be accessible to installation natural resource managers, and other personnel, as applicable.

Table 16-3: Fish & Wildlife Tasks Performed Annually	
Project/Action	**Description**
Provide for public access to fish and wildlife resources	Identify and support opportunities for public access, consistent with military mission (e.g., hunting, fishing, viewing wildlife, etc.). Evaluate and advise on requests from the public for access.
Participate in DoD and DA regional conservation programs	Participate in DoD and DA regional programs (e.g., PIF, PARC, Chesapeake Bay Program, etc.), as applicable to Fort Belvoir
Maintain wildlife crossing structures	Monitor condition and wildlife use of wildlife crossing structures. Perform annual maintenance. Identify any needed repairs/modifications. Identify locations where new wildlife crossing structures may benefit wildlife conservation and installation operations.
Perform bird surveys	Perform annual surveys for land and shorebirds.
Perform deer surveys	Perform annual deer spotlight survey (late summer – early fall). Identify and perform other deer surveys (e.g., browse, herd health, etc.), as needed.
Perform bald eagle surveys	Perform annual bald eagle nest survey, as well as year-round surveillance of nest site conditions. Monitor eagle activity, year-round, addressing foraging, loafing and roosting activity, in addition to nesting.
Maintain nest structure program	Assess, and maintain as appropriate, the blue bird and wood duck nest box program, and the osprey nest platform program. Assess opportunities for additional nest structure programs.
Provide hunting programs	Provide a hunting program. Manage the deer component of the hunting program to reduce and stabilize the deer population.
Provide access to fishing	Provide access to installation shoreline and ponds for fishing, as appropriate. Maintain fishing piers. Maintain Mulligan Pond as fish habitat.
Participate in DMAP	Participate in VDGIF DMAP. Submit required information to VDGIF.
Maintain iSportsman	Maintain the iSportsman system annually, and update software as new technology becomes available.

16.6.1.4 Endangered Threatened and Rare Species Annual Projects and Actions

Table 16-4: Endangered Threatened and Rare Species Tasks Performed Annually	
Project/Action	**Description**
Maintain endangered, threatened, rare species and rare ecological communities information in installation documents and databases	Maintain and update baseline information in installation documents and databases, as appropriate (recognizing the need for protecting the locations of endangered, threatened and rare species). Review, verify, and update information in the GIS. Field verify, as needed.
Perform year-round surveillance of endangered, threatened species, and their habitats	Monitor known listed threatened and endangered species in the field.
Perform year-round surveillance of rare ecological communities	Review existing conditions in the field. Evaluate presence and effect of stressors (e.g., invasive plants, stormwater flows, sedimentation, etc.) and propose action, as appropriate. Select representative sample to survey each year.
Review ongoing and proposed installation actions for potential to impact threatened, endangered, or rare species, or rare ecological communities	Assess threatened, endangered and rare species, and rare ecological communities in planning actions (e.g., real property master planning, small area planning, stationing, real estate actions, privatization, siting, etc.); NEPA evaluations and mitigations; engineering planset development and review; environmental permitting; environmental restorations; military testing and training; operations and maintenance; excavation and demolition permitting; work order review; and, all other installation project and activity review processes. Advise on strategies to avoid impact, and on regulatory compliance requirements where there is a potential for impact.
Incorporate endangered/threatened species protection requirements into operations	Incorporate endangered/threatened species protection requirements (e.g., those pertaining to Northern Long-eared Bat) into installation practices.

Table 16-4: Endangered Threatened and Rare Species Tasks Performed Annually	
Project/Action	**Description**
Conserve endangered, threatened and rare species habitats, and rare ecological communities	Continue to consider threatened and endangered species and their habitat as resources warranting special conservation efforts and designation as "Special Natural Areas" under DoDI 4715.03. Maintain existing Special Natural Area boundaries. Designate new Special Natural Areas where there is a legal requirement to do so.
Identify and manage regulatory compliance	Utilize the NEPA process to insure compliance with federal and state law
Coordinate with regulatory and stewardship agencies	Maintain regular professional coordination with regulatory agencies (e.g., USFWS, VDGIF) and with stewardship agencies (e.g., DCR-NHP), as appropriate.
Prepare and maintain policies and guidance documents	Review and revise existing written policy and guidance (i.e., *Memorandum of Instruction - Northern Long-eared Bat Protection on Fort Belvoir*). Evaluate the need for any additional Fort Belvoir-specific policy or guidance documents.
Support emergency situations	Provide technical assistance to emergency situations (e.g., trapped bat), under the direct supervision of an installation Special Agent with conservation law enforcement authority under a Memorandum of Agreement between U.S. Department of the Interior and Fort Belvoir.
Support regulatory enforcement	Enforce federal and state laws and regulations as applicable to Fort Belvoir, as well as DoD, DA and Fort Belvoir policies. (Enforcement is done by an installation Special Agent with conservation law enforcement authority under a Memorandum of Agreement between U.S. Department of the Interior and Fort Belvoir.)
Perform Invasive Species Removal	Identify locations where invasive species could impact rare, threatened and endangered species, or rare plant communities, and advise on actions to remove the invasive vegetation.
Provide endangered species awareness training	Provide training to garrison, partner, tenant, and contractor staff, as appropriate. Write and publish articles.
Perform installation-wide acoustic	Monitor installation bat population and their use of landscape.

Table 16-4: Endangered Threatened and Rare Species Tasks Performed Annually	
Project/Action	**Description**
monitoring and mist netting of bats	
Perform winter/spring aquatic wood turtle surveys	Perform visual encounter surveys in aquatic habitat.
Perform summer terrestrial wood turtle surveys	Perform visual encounter surveys in terrestrial habitat.
Perform spotted turtle surveys	Perform population surveys and habitat usage surveys to identify significant resources.
Perform amphipod (*Stygobromu*s spp.) surveys	Monitor current populations and seep conditions. Survey additional areas to identify additional species and populations.
Perform acoustic and mist netting surveys of bat migratory patterns	Survey bat populations during important migratory periods - spring, winter and fall
Perform small whorled pogonia survey	Perform annual monitoring of known occurrence of small whorled pogonia.
Perform installation-wide rare species surveys	Survey to locate new (i.e., not previously documented on-site, or newly listed) rare species, and to monitor populations of species known on site.
Perform installation-wide threatened and endangered species surveys	Survey to locate potential presence of new (i.e., not previously documented on-site, or newly listed) threatened and endangered species, and to monitor populations of species known on site.
Perform installation-wide surveys for	Survey to identify new (i.e., not previously documented on-site, or newly listed) National Listing Workplan species, and to monitor current populations and habitat conditions

Table 16-4: Endangered Threatened and Rare Species Tasks Performed Annually	
Project/Action	**Description**
National Listing Workplan species	
Perform freshwater mussel surveys	Monitor known mussel beds and survey aquatic areas to identify new beds and species.
Perform pollinator surveys	Develop and implement installation-wide survey to identify rare, threatened, and endangered pollinators.

16.6.1.5 Special Natural Areas Annual Projects and Actions

Table 16-5: Special Natural Areas Tasks Performed Annually	
Project/Action	**Description**
Identify and conserve areas of significant natural resources, in accordance with DoDI 4715.03	Continue to consider ecologically significant natural resources as resources warranting special conservation efforts and designation as "Special Natural Areas" under DoDI 4715.03. Maintain existing Special Natural Area boundaries. Designate new Special Natural Areas where there is a legal requirement to do so.
Maintain Special Natural Area (SNA) boundaries in installation documents and databases	Review, verify, publish existing SNA boundaries in RPMP, Small Area Plans, real property records, etc. Review, verify depict SNA boundaries in GIS.
Maintain signage and markers for SNA boundaries in the field	Review, install, and maintain SNA signage and markers, including boundary markers.
Monitor conditions in SNAs	Review existing SNA boundaries, overall natural resource conditions, and ongoing management actions, for effectiveness at conserving natural resources, without net loss of military training. Evaluate presence and effect of stressors, and propose action as appropriate. This includes fish and wildlife surveys done in conjunction

Table 16-5: Special Natural Areas Tasks Performed Annually	
Project/Action	**Description**
	with the Fish and Wildlife program. Such surveys include wildlife movement and effectiveness of existing wildlife crossing structures.
Review ongoing and proposed installation actions for potential impact to SNAs	Assess SNAs in planning actions (e.g., real property master planning, small area planning, stationing, real estate actions, privatization, siting, etc.); NEPA evaluations and mitigations; engineering planset development and review; environmental permitting; environmental restorations; military testing and training; operations and maintenance; excavation and demolition permitting; work order review; and, all other installation project and activity review processes. Advise on strategies to avoid/minimize impact, and on regulatory compliance requirements, as appropriate.
Identify possible projects/actions to preserve/enhance natural resources within SNAs	Cross-walk with the water resources, vegetation, fish and wildlife, and endangered/threatened/rare species programs to address needs, and potential projects and actions within the SNAs. Incorporate results into annual funding requests, annual work plans, mitigation planning, etc.
Monitor use of SNAs	Obtain information on access and use of SNAs through such means as trail cameras, user surveys, use/access permits, etc. to evaluate type, magnitude, and effect of access and use
Maintain policies for access and use of SNAs	Review and revise existing policies regarding access to and use of SNAs. Include policies in such installation documents as Trail Pamphlets and Installation Policy Memos. Evaluate need for additional Fort Belvoir-specific policies, and prepare as necessary.
Review requests for non-routine access and use of SNAs	Review and respond to access and use requests. Balance public access with mission and resource conservation. Monitor for effect of such use on resource, and modify use policy as necessary.
Maintain existing hiking trail systems	Develop and execute annual maintenance plan for existing trails, access points and signage, including directional and interpretive signs.
Maintain existing fishing structures and	Develop and execute annual maintenance plan for existing fishing structures and wildlife viewing structures

Table 16-5: Special Natural Areas Tasks Performed Annually	
Project/Action	**Description**
wildlife viewing structures	
Maintain existing outdoor conservation education displays	Develop and execute annual maintenance plan for existing conservation education displays
Maintain ABWR Environmental Education Center	Develop and execute annual maintenance plan for the ABWR Environmental Education Center building, and the conservation education displays and materials interior to the building
Operate ABWR Environmental Education Center	Hold natural resources conservation education programs and events
Host natural resources conservation and service events	Design and host such events as nature hikes, outdoor classrooms, celebrations/commemorations (e.g., Earth Day), volunteer service (e.g., shoreline clean ups, National Public Lads Day), as appropriate. Make available to the public, consistent with operations and security conditions
Support volunteer projects	Provide technical guidance (regarding natural resources conservation) and support such volunteer projects as Boy Scouts service and medal projects, Virginia Bluebird Society bluebird nest box program, etc., as appropriate. Investigate having a Qualified Volunteer Program to support natural resources stewardship. Investigate partnerships with outside organizations, such as universities.
Publish educational information on natural resources and natural resources conservation	Write and publish articles for Fort Belvoir website, newspaper (Belvoir Eagle), DoD Chesapeake Bay program publications, etc., as appropriate.
Provide technical information on Fort Belvoir's designated Special Natural Areas	Respond to requests from on-post and off-post entities, as appropriate. Maintain/manage installation Special Natural Areas information to be accessible to installation natural resource managers, and other personnel, as appropriate.

Table 16-5: Special Natural Areas Tasks Performed Annually	
Project/Action	**Description**
Provide technical information on natural resources and natural resources conservation	Respond to requests for technical information and presentations (e.g., Environmental Career Day at local school) from on-post and off-post entities, as appropriate.
Maintain Natural Resources Management coordination on a regional level	Coordinate with managers of off-post natural areas within the region. Include discussion of partnerships/cooperation on regional stewardship initiatives, as appropriate.

16.6.2 Planned Projects

Table 16-7 through 16-9 refer to future projects that are scheduled, or are in planning phases to be implemented in corresponding fiscal years. These projects are personnel, resource, and funding dependent and may vary or be implemented in earlier or later fiscal years as resources are available or become available.

16.6.2.1 Water Resources Planned Projects

Table 16-6: Water Resource Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
FY20, FY25, FY30	Update watershed PLS	Survey and revise watershed and subwatershed data, including – boundaries, land use and cover (e.g., % impervious, % forested, etc.), stream channel conditions. Update GIS.
FY20, FY25, FY30	Update wetland PLS	Update wetland data, including planning level wetland boundaries, wetland type, locations of permitted work, and locations of mitigation sites. Update GIS.
FY20, FY25, FY30	Update RPA PLS	Perform installation-wide stream perennially determinations to identify RPAs. Complete approximately 1/3 of installation streams on 2-year cycle. Include locations of shoreline stabilization projects,

Table 16-6: Water Resource Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
		riparian reforestation/replanting projects, and any other mitigation projects in the RPA. Update GIS.
FY20, FY30	Inventory marine systems	Perform baseline inventory of marine systems along the installation's shoreline. Address SAV, mollusks, anadromous fish, benthics, water quality, etc.
FY21, FY31	Forecast future changes to wetlands and near-shore conditions	Develop forecast trends and models utilizing baseline data. Include a threat assessment to ecologically valuable ecosystems from potential sea level and climate changes.
FY19, annual updates thereafter	Bring the wetland permit database on-line	Bring the wetland permit database on-line, integrating it with the GIS. Database includes wetland permit records in a searchable electronic format.
FY19, annual updates thereafter	Develop and implement a water resources database	Create a database that stores and organizes water resources information, including wetland, stream shoreline, macroinvertebrate, shellfish, mitigation sites, etc. Database should enable year-to-year comparisons of data, easy retrieval of information. Include mitigation sites.
FY19	Protect riparian buffers	Create a comprehensive Fort Belvoir riparian buffer policy. Include both regulatory driven RPAs, as well as buffers along waterways that are outside the RPA.
FY20, annual monitoring thereafter	Monitor high-rarity ranked wetland communities	Develop and implement a program to monitor conditions within the high-rarity ranked wetland communities.
FY18, FY19, FY20, FY21, FY22, FY23	Restore streams	Plan, design, construct and monitor stream restoration projects, in accordance with the RPMP.

Table 16-6: Water Resource Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
FY21, FY23	Restore shoreline areas	Plan, design, construct and monitor shoreline restoration projects.

16.6.2.2 Vegetation Planned Projects

Table 16-7: Vegetation Management Projects Planned		
Implementation years	**Task**	**Projected Work**
FY20, FY30	Update plant communities PLS	Survey and revise the plant communities data. Update GIS.
FY20, FY30	Update ecological communities PLS	Survey and revise ecological communities data. Update GIS.
FY20, FY25	Update Natural Heritage inventory	Survey and revise natural heritage inventory, with emphasis on Accotink Creek Conservation Corridor in FBNA. Update GIS datalayer.
FY20, FY30	Update floristic inventory	Survey and revise floristic inventory.
FY20, annual updates thereafter	Prepare comprehensive invasive vegetation control plan	Survey and map existing areas of invasive vegetation. Prepare a comprehensive management plan to control existing invasive vegetation and to reduce risk of new introductions. Update GIS datalayer.
FY19, FY29	Complete forest (timber) inventory	Perform a forest (timber) inventory of the portion of the installation that was not inventoried in 2016. Follow same protocol as in 2016. Update GIS.
FY21, annual updates thereafter	Develop and implement vegetation	Create a database that stores and organizes vegetation resources data (e.g., ecological communities, reforestation sites, etc.) to enable

Table 16-7: Vegetation Management Projects Planned		
Implementation years	**Task**	**Projected Work**
	resources database	year-to-year comparative evaluation, and that supports forecasting of potential future conditions. Include mitigation project sites.
FY19, FY20, FY21	Control multi-acres areas of invasive vegetation	Treat multi-acre sites of invasive vegetation (e.g., Phragmites, kudzu, wisteria, princess tree/tree of heaven).
FY18, FY19, FY20, FY21, FY22, FY23, FY24, FY25	Perform timber stand improvements	Perform timber stand improvements at several multi-acre sites in the southwest training area and FBNA to support wildlife habitat enhancement.
FY18, FY19, FY20, FY21, FY22, FY23	Restore streams	Plan, design, construct and monitor stream restoration projects, in accordance with the RPMP.
FY21, FY23	Restore shoreline areas	Plan, design, construct and monitor shoreline restoration projects.
FY18, annual thereafter	Maintain and enhance forest cover in FWC	Replant, or allow regeneration to occur in, previously disturbed locations within FWC.

16.6.2.3 Fish and Wildlife Planned Projects

Table 16-8: Fish and Wildlife Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
FY18, FY23, FY28	Update herpetofauna PLS	Survey and revise reptile and amphibian PLS. Update GIS.
FY18	Perform habitat improvement in W-5	Perform timber stand improvement.
FY18, FY20, FY 22, FY24, FY26,	Perform habitat improvement at	Perform pine thinning to enhance habitats and evaluate past pine thinning projects for selective thinning.

Table 16-8: Fish and Wildlife Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
FY28, FY30, FY32	multiple locations in southwest training area	
FY19, FY24	Update fish PLS	Survey fish populations in installation waterways and ponds, and assess habitat conditions.
FY19, FY29	Update small mammal inventory (part of wildlife PLS)	Survey and revise the small mammal inventory. Update GIS datalayer.
FY18	Modify chimneys to enhance chimney swift habitat	Remove unapproved chimney caps, and repoint chimneys as needed, to improve access and conditions for chimney swifts.
FY19, FY29	Perform aquatic survey of Mulligan Pond	Field survey for fish, benthics, reptiles and amphibians, etc. Prepare management recommendations to conserve/enhance resource conditions, and improve recreation value. Update GIS.
FY19, FY24	Perform insect and pollinator inventory and abundance survey	Survey for pollinators. Enter into GIS database.
FY19	Update bird checklist	Update the bird checklist to reflect the most-recent bird survey data.
FY20, FY25, FY30	Perform habitat enhancement in T-9	Thin and cut trees to maintain T-9 early successional habitat (an existing habitat project).
FY20, FY25, FY30	Perform fish and aquatic insect inventory and abundance surveys	Perform stream health surveys in multiple small streams throughout the installation.
FY22, FY27, FY32	Perform habitat enhancement at FBNA	Thin and cut trees to maintain early successional habitat at an existing habitat project.

Table 16-8: Fish and Wildlife Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
FY22, FY27, FY32	Update wildlife crossing condition and use assessment	Survey and monitor existing wildlife crossings following the protocol used in the 2016 monitoring project. Include crossing structures that are constructed after the 2016 project.
FY20, FY30	Perform habitat enhancement of Mulligan Pond	Develop and execute projects to enhance fish and their habitat at Mulligan Pond.
FY19, annual updates thereafter	Develop and implement a fish and wildlife database	Create a database to store fish and wildlife data, that enables year-to-year comparative evaluations. Include habitat enhancement and mitigation project sites.

16.6.2.4 Endangered, Threatened, and Rare Species Planned Projects

Table 16-9: Endangered, Threatened, and Rare Species Planned Projects		
Implementation Years	**Task**	**Projected Work**
FY19	Update rare species PLS	Survey and revise the rare species PLS. Update GIS datalayer.
FY19	Update endangered and threatened species PLS	Survey and revise the endangered and threatened species PLS. Update GIS datalayer.
FY19, annual updates thereafter	Develop and implement an endangered, threatened, and rare species database	Create a database to store endangered, threatened and rare species data that enables year-to-year comparative evaluations. Include data associated with Endangered Species Act Section 7 consultations and data required to be reported to the regulatory agencies (e.g., USFWS, VDGIF).

16.6.2.5 Special Natural Areas Planned Projects

Table 16-10: Special Natural Areas Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
FY18, FY20, FY22, FY24, FY26, FY28, FY30, FY32	Issue Trail Pamphlets	Revise ABWR Trail Pamphlet. Develop trail pamphlets for JMAWR and T-17 Refuge.
FY19, FY24, FY29	Issue Species Checklists	Revise Fort Belvoir Bird Checklist. Develop and publish species checklists for plants, wildlife.
FY19, FY27	Provide Outdoor Education Displays	Design replacement outdoor education displays for ABWR, JMAWR and T-17 Refuge.
FY20, FY28	Provide Outdoor Education Displays	Purchase and install replacement outdoor displays for ABWR, JMAWR and T-17 Refuge.
FY 20	Provide Outdoor Education Displays	Investigate development and use of educational applications for cell phones and other mobile devices.
FY20	Provide Indoor Education Displays and Materials	Design indoor education displays for ABWR Environmental Education Center.
FY21	Provide Indoor Education Displays and Materials	Purchase and install indoor education displays for ABWR Environmental Education Center facility.
FY18, FY28	Maintain ABWR Environmental Education Center	Execute repairs and improvements to ABWR Environmental Education Center.
FY20, FY25	Provide Nature Trails in Refuges	Execute major trail and associated facilities renovation in ABWR, JMAWR and T-17 Refuge.

Table 16-10: Special Natural Areas Management Projects Planned		
Implementation Years	**Task**	**Projected Work**
TBD	Provide Fishing Piers and Wildlife Viewing Structures	Execute major renovations to existing fishing piers and wildlife viewing structures at JMAWR and along Gunston Cove.
FY19, FY29	Maintain SNA Designations	Incorporate SNA area designations in next update to Fort Belvoir RPMP.
FY19	Assess Conservation Needs and Prepare Management Plan	Assess the conservation needs of the newest Special Natural Areas (i.e., T-17 Refuge and Accotink Creek Conservation Area), and prepare area-specific conservation strategies.
FY19	Develop and Maintain Database	Develop and maintain a database for the Special Natural Areas
FY19, and annual thereafter	Identify and Perform Resource Protection/Enhancement Projects	Identify and perform projects to protect/enhance resources of conservation emphasis within the Special Natural Areas. (These projects may be addressed Water Resources, Vegetation, Fish and Wildlife, and Threatened/Endangered Species.)
FY20, FY25, FY30	Survey Migratory Fish	Survey for presence, passage of migratory fish within/through ABWR, JMAWR and Accotink Creek Conservation Corridor
FY20, FY23, FY26, FY29	Monitor Ecological Condition of Special Natural Areas	Perform wildlife movement surveys within FWC, including surveys of use of wildlife crossing structures.

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18.0 ACRONYMS AND ABBREVIATIONS

ABWR	Accotink Bay Wildlife Refuge
ABWR EEC	Accotink Bay Wildlife Refuge Environmental Education Center
ACCC	Accotink Creek Conservation Corridor
ACQR	Air Quality Control Regions
ACSIM	Assistant Chief of Staff for Installation Management
AEC	Army Environmental Command
AMEDD	Army's Medical Department
ALOS	Advanced Land Observing Satellite
APHC	Army Public Health Command
APHIS	Animal and Plant Health Inspection Service
AQF	Air Quality Forecasting
AR	Army Regulation
ATV	All-Terrain Vehicle
BASOPS	Base Operations and Support
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BMP	Best Management Practice
BOID	Business Operations and Integration Division
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CBP	Chesapeake Bay Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERL	Construction Engineering Research Laboratory
CFR	Code of Federal Regulations
CID	Criminal Investigation Division
CPAC	Civilian Personal Advisory Center
CWA	Clean Water Act
CWD	Chronic Wasting Disease
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DA	Department of Army
DAAF	Davison Army Airfield
DBH	Diameter-at-Breast-Height
DCA	Washington Regan National Airport
DCR-NHP	Department of Conservation and Recreation-Natural Heritage Program
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DES	Directorate of Emergency Services
DFMWR	Directorate of Family Morale, Welfare and Recreation

DHR	Directorate of Human Resources
DoD	Department of Defense
DoDI	Department of Defense Instruction
DPTMS	Directorate of Plans, Training, Mobilization and Security
DPW	Directorate of Public Works
DRM	Directorate of Resource Management
DVP	Dominion Virginia Power
E&S	Erosion and Sediment
EA	Environmental Assessment
EHD	Epizootic Hemorrhagic Disease
EIS	Environmental Impact Statement
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
EPG	Engineer Proving Ground
ERDC	Engineer Research and Development Center
FBNA	Fort Belvoir North Area
FBRC	Fort Belvoir Residential Communities
FHWA	Federal Highway Administration
FNSI	Finding of No Significant Impact
FOIA	Freedom of Information Act
FR	Federal Register
FS	Feasibility Study
FWC	Forest and Wildlife Corridor
GFEBS	General Financial Enterprise Business System
GIS	Geographic Information System
GSA	General Services Administration
HEC	Humphreys Engineer Center
HQDA	Headquarters Department of Army
IAW	In Accordance With
IMCOM	Installation Management Command
INRMP	Integrated Natural Resources Management Plan
INSCOM	Army Intelligence and Security Command
IPMC	Integrated Pest Management Coordinator
IPMP	Integrated Pest Management Plan
IRP	Installation Restoration Program
ISA	Interagency Support Agreements
ISR	Installation Status Report
IWFMP	Integrated Wildland Fire Management Plan
JMAWR	Jackson Miles Abbott Wetland Refuge
LID	Low Impact Development
O&M	Operations and Maintenance
ORV	Off-Road Vehicle
MACOM	Major Command

MDW	Military District of Washington
MICC	Mission and Installations Contracting Command
MLRA	Major Land Resources Area
MMRP	Military Munitions Response Program
MOU	Memoranda of Understanding
MS4	Municipal Separate Storm Sewer Systems
MSL	Mean Sea Level
MSS	Mission Sensitive Species
NAAQS	National Ambient Air Quality Standards
NABCI	North American Bird Conservation Initiative
NCPC	National Capital Planning Commission
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NGA	National Geospatial Intelligence Agency
NGO	Non-Government Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Agency
NPS	National Park Service
NRCS	Natural Resources Conservation Services
NWS	National Weather Service
NWSG	Native Warm Season Grass
PALSAR	Phased Array type L-Band Synthetic Aperture Radar
PAO	Public Affairs Office
PARC	Partners in Amphibian and Reptile Conservation
PHNST	Potomac Heritage National Scenic Trail
PIF	Partners in Flight
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RPA	Resource Protection Area
RPMP	Real Property Master Plan
RV	Recreational Vehicle
SF	Square Feet
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SJA	Staff Judge Advocate
SNA	Special Natural Area
spp	Species
SOC	Species of Concern
TMDL	Total Maximum Daily Load
UP	Utilities Privatization
USACE	United States Army Corps of Engineers
USALSA	United States Army Legal Services Agency

USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USO	United Service Organizations
VDACS	Virginia Department of Agriculture and Consumer Services
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historical Resources
VDOF	Virginia Department of Forestry
VMRC	Virginia Marine Resources Commission
VPDES	Virginia Pollutant Discharge Elimination System
WHMP	Wildlife Hazard Management Plan
WIVA	Watershed Inventory for Vulnerability Assessment
WOUS	Waters of the United States
WWG	Wildlife Working Group

Appendix A

U.S. Forest Service and Fort Belvoir Interagency Agreement

MEMORANDUM OF AGREEMENT

between the

UNITED STATES DEPARTMENT OF AGRICULTURE

and the

UNITED STATES DEPARTMENT OF DEFENSE

for the

CONDUCT OF FOREST INSECT AND DISEASE SUPPRESSION ON LANDS ADMINISTERED BY THE U.S. DEPARTMENT OF DEFENSE

Suppression of damaging forest insect and disease outbreaks is essential for maintaining the health and productivity of the nation's forests. Annually, insects and diseases kill more trees and reduce forest growth more than all other destructive agents combined. This is a matter of great concern to the administrators responsible for managing and protecting forests on public and private lands.

Section 5 of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2101) authorizes the Secretary of Agriculture to protect trees and forests, wood products, stored wood and wood in use from insects and diseases. This is done directly by the USDA on National Forest System lands and in cooperation with other Federal land managing agencies, the States and private land owners on other forest lands. The Secretary of Agriculture has delegated the responsibility for carrying out the provisions of the Cooperative Forestry Assistance Act to the Forest Service. Annual appropriations, based on estimated suppression costs developed by the Forest Service, the Department of Defense, other Federal agencies, States and other cooperating entities, are necessary to implement this responsibility.

It is Agreed:

1. That the two Departments will, under the legal, fiscal and other limitations governing each, cooperate fully in the planning, coordination and execution of field operations to prevent and suppress damaging forest insect and disease outbreaks whenever it is determined to be necessary.

2. That the guiding principles of this cooperation shall be those established by authorizing legislation, agency policy and other direction specified in the Cooperative Forestry Assistance Act of 1978, the National Environmental Policy Act and the Federal Insecticide, Fungicide, and Rodenticide Act as amended.

3. That the Secretaries of the Department of Agriculture and the Department of Defense shall authorize their respective agencies concerned with the suppression of forest insects and diseases to develop and execute coordinated work programs and projects.

4. That, for coordinating and funding forest insect and disease suppression programs and projects, the Departments will:

A. *Responsibilities of the Department of Agriculture, Forest Service:*

(1) Designate an office which will be responsible for coordinating activities conducted under this MOA.

(2) Provide overall leadership and coordination for insect and disease suppression activities on forest lands when the activities are financed wholly or in part with Federal funds appropriated under Section 5 of the Cooperative Forestry Assistance Act of 1978 (16 USC 2101).

(3) To the extent possible, provide technical and financial assistance to agencies of the Department of Defense for forest insect and disease suppression programs and gypsy moth eradication projects on forest lands administered by the Department of Defense.

(4) Conduct detection surveys and biological evaluations of insect and disease outbreaks on forest lands administered by the Department of Defense.

(5) Subject to budgetary limitations, annually transfer from the USDA Forest Service, Forest Pest Management to Department of Defense Agencies such finances as are mutually determined as necessary for forest insect and disease suppression on forest lands administered by the Department of Defense. To the extent possible, jointly determine annual suppression funding needs by November 30.

(6) Assist agencies of the Department of Defense in organizing and performing general forest insect and disease field surveillance on forest lands administered by the Department of Defense.

(7) Inform local and national Department of Defense personnel of forest insect and disease conditions on other lands that may affect Department of Defense administered land.

(8) Suppress forest insect and disease outbreaks on National Forest System lands and cooperate with other agencies to suppress forest insect and disease outbreaks which threaten forest lands administered by the Department of Defense.

(9) Provide training opportunities for Department of Defense personnel in techniques for the prevention, detection and suppression of destructive forest insects and diseases in order to promote forest health.

b. *Responsibilities of agencies of the Department of Defense:*

(1) Designate an office which will be responsible for coordinating activities conducted under this MOA.

(2) Notify DoD Agencies that technical assistance is available from the Forest Service and that a biological evaluation or equivalent documentation is required before funds for a forest pest suppression project can be transferred from the Forest Service.

(3) Facilitate conduct of detection surveys and forest insect and disease evaluations by Forest Service personnel on Department of Defense administered lands.

(4) Base decisions on whether to implement suppression programs and projects on:

(a) An appraisal of current pest infestation significance and projected significance with and without suppression activities. This information, as well as a discussion of alternative pest management tactics, is provided by the Forest Service in a biological evaluation.

(b) An evaluation of the resources threatened within the context of management objectives.

(c) An analysis of possible adverse environmental effects of suppression alternatives.

(d) An economic analysis of the proposed action.

(5) Perform field surveillance and specialized detection surveys as necessary to supplement Forest Service activities.

(6) Conduct suppression activities on Department of Defense administered land.

(7) Cooperate with other agencies on adjacent or intermingled lands on forest insect and disease surveillance, prevention and suppression activities.

(8) Report suppression project accomplishments to the Forest Service by November 1 each year covering all forest insect and disease management expenditures for the previous fiscal year.

(9) Participate in an annual coordination meeting with the Forest Service to set priorities for funding proposed forest pest suppression projects.

(10) Submit a formal request for forest insect and disease suppression funding to USDA Forest Service by November 15 of each year.

This agreement is effective upon the date of signature by both parties. It defines, in general terms, the basis on which the parties will cooperate and is not a financial obligating document.

This agreement shall continue indefinitely, but may be modified or discontinued at the request of either party. Requests for termination or any change shall be submitted to the other party for consideration not less than 30 days in advance of the effective date desired.

F. Dale Robertson
Chief
Forest Service

Date: November 15, 1990

Thomas E. Baca
Deputy Assistant Secretary
of Defense for Environment

Date: December 11, 1990

Forest Pest Suppression Program Background and Procedures

1. Forest Pest Suppression monies are allocated by Congress to the U.S. Forest Service for the agency's support of forest pest suppression on federal agencies land. The funds are "no year" and can only be used for USFS approved FPS projects.

2. If an installation believes they have a pest problem, they should contact the USFS, (Attachment (4)), to provide survey support and a biological assessment to determine if control measures are needed. USFS personnel can also provide training to installation personnel, if requested.

3. If a survey indicates a need for control, installations should submit a USFS FS-3400-2 form, (Attachment (5)), to the Armed Forces Pest Management Board (AFPMB) through the chain of command.

4. Funding requests should be for the cost of contracting the control operation. In house costs such as the cost of pest management and natural resource personnel time to administer and support the operation should not be charged to the project. However, if the installation contract support office charges for their services, then those costs could be charged to the project.

5. The AFPMB forwards all requests to USFS Headquarters for approval. The USFS approves a project, based on a biological assessment recommending control measures be applied, by evaluating the USFS FS-3400-2 form, and consulting with the local USFS field office.

6. The USFS informs the AFPMB of all approved projects and the funding level. The USFS executes the paper work at the beginning of the second quarter of the fiscal year, informing the US Treasury to send the appropriate funding to each of the services. The USFS doesn't know all its requirements or how much funds it has until late December. The AFPMB informs each of the service program managers, both pest management and natural resources. The program managers in turn inform the appropriate installations and also inform their service Comptroller to forward the funds to the designated installations for the specific FPS project.

7. If the funding requested and approved is not fully expended on the project; (for example, the pest population collapsed or weather conditions are unfavorable during the insect's susceptible stage, or the project costs were over estimated) **the funds are not available for any other FPS project, unless USFS approval is given**. These "leftover" funds can only be expended after submitting a FS-3400-2 form for another project and receiving USFS approval.

8. Unused USFS funds remain at the receiving installation but are under the accountability of the Service Program Manager. These unused "no year" USFS funds are to remain available and be subject to withdrawal by the Service Program Manager for use by another installation or until the USFS gives approval for use by the installation for a new forest pest suppression project.

9. Accurate accountability of funds expended is, as always, an integral part of the program. **Please note, if you received funding for a project in FY 97, a brief report, (Attachment (6)), of the accomplishments and funds expended is required to be sent up through the chain of command to the AFPMB by Oct 15, 1997.**

10. Please note the milestone dates, (Attachment (3)), by which notification, actions, and information need to be forwarded to the appropriate command level. The AFPMB will roll all DoD activity requests, submitted FS-3400-2 forms, and accomplishment reports into a single report for submission to the USFS.

As a final reminder, if aerial application of pesticide is to be the method of control, the project must be approved IAW DoD Instruction 4150.7 and service component environmental documentation requirements, environmental analysis and validation.

Appendix B

Integrated Natural Resources Management Plan Rivanna Station

Integrated Natural Resources Management Plan

2017

Rivanna Station
Charlottesville, Virginia
US Army Garrison Fort Belvoir

Prepared For
U.S. Army Garrison, Fort Belvoir
Environmental & Natural Resource Division
Directorate of Public Works
Fort Belvoir, VA

Prepared By
U.S. Army Engineer Research and Development Center
Environmental Laboratory
Vicksburg, MS

April 2017

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INTEGRATED NATURALL RESOURCS MANAGEMENT PLAN
RIVANNA STATION
US ARMY GARISON FORT BELVOIR, VA

1.0 RIVANNA STATION LOCATION

Rivanna Station is a sub-installation of United States (US) Army Garrison Fort Belvoir. Rivanna Station was acquired in the late 1990's and currently consists of approximately 75.5 acres of land, approximately 95 miles driving distance from the Fort Belvoir Main Post area. The installation is located adjacent to the North Fork Rivanna River (NFRR) in Albermarle County, approximately 12 miles north of Charlottesville, Virginia. Rivanna Station is accessible via Boulders Road, located off of U.S. Highway 29/Seminole Trail, a major urban growth corridor for the greater Charlottesville region (US Army Fort Belvoir, 2016). Figure 1 illustrates the location of Rivanna Station.

2.0 RIVANNA STATION FACILITIES

Rivanna Station is home to three primary mission partners reporting directly to the Department of Defense (DoD): the National Ground Intelligence Center (NGIC), Defense Intelligence Agency (DIA), and the National Geospatial- Intelligence Agency (NGA). United States Army Intelligence and Security Command (INSCOM) headquartered on Fort Belvoir, conducts intelligence, security and information operations for military commanders and national decision makers. NGIC, one of INSCOM's major subordinate commands, is DoD's primary producer of ground 1 forces intelligence. DIA is a DoD combat support agency that produces, analyzes, and disseminates military intelligence information to combat and noncombat military missions. NGA provides timely, relevant, and accurate geospatial intelligence in support of national security (US Army Fort Belvoir, 2016).

NGIC operations at Rivanna Station are housed in the Nicholson Building, a 258,000 square foot facility constructed in 2000. DIA operations associated with the Joint Use Intelligence Analysis Facility (JUIAF) at Rivanna Station are housed in the Rowe Building, a 170,500 square foot facility constructed in 2010. The NGA personnel on Rivanna Station are co-located in the Rowe and Nicholson buildings. The Station also includes a Child Development Center (CDC), Access Control Point (ACP) and Visitor Control Center (VCC) buildings and a Remote Delivery Facility (RDF). Current mission functions which are located off-site include personnel in leased office space located immediately to the northeast of the existing campus in United Land Corporation's (ULC) building #1; parking located on leased property immediately to the north of the existing campus; and warehousing and deliveries screening functions located in leased space in a remote location in downtown Charlottesville (US Army Fort Belvoir, 2016). Figure 2 depicts the facilities located on and immediately surrounding Rivanna Station.

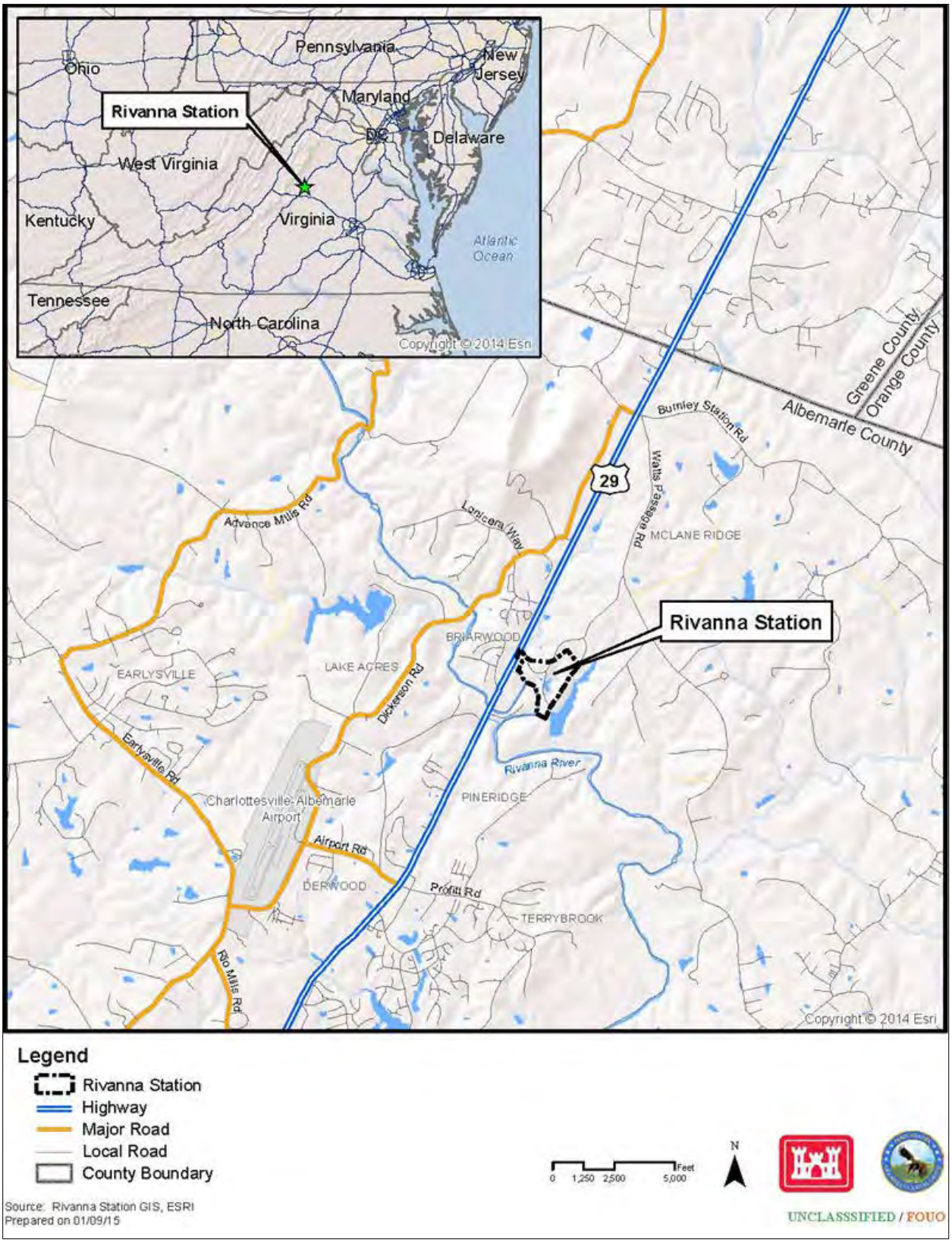

Figure 1. Rivanna Station Location Map.

Figure 2. Rivanna Station Facilities Map.

3.0 RIVANNA STATION PHYSICAL RESOURCES

3.1 Topography

The topography of Rivanna Station is varied, and the locations of buildings and parking areas take advantage of the flatter portions of the terrain. Figure 3 provides an illustration of the topography at Rivanna Station. The elevation at Rivanna Station ranges from approximately 350 feet above mean sea level (MSL) along the NFRR to above 500 feet MSL in the vicinity of ULC #1. There is approximately 150 feet of topographic change at Rivanna Station between the southern and northern boundaries. The landscape varies from steep stream valleys to the south along the NFRR to rolling hills and some flat areas north of the river (US Army Fort Belvoir, 2016).

3.2 Geology

Rivanna Station is located in Virginia's Piedmont physiographic province, the Commonwealth's largest physiographic province. To the east is the Fall Zone, which separates the Piedmont from the Coastal Plain, and to the west lies the mountains of the Blue Ridge province. The Piedmont province consists of gently rolling hills, deeply weathered bedrock and few rock outcrops. Most rocks at the surface become weathered in the humid climate and are buried under a blanket of "rotten rock," called saprolite, which is several meters (m) thick (US Army Fort Belvoir, 2016). The bedrock is comprised of many igneous and metamorphic rocks.

Figure 3. Rivanna Station Topography Map.

3.3 Soils

Soil data for Rivanna Station was obtained from the US Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). As shown in Figure 4, soil types within the general study area include Albemarle fine sandy loam, Albemarle very stony fine sandy loam, Buncombe loamy sand, Catoctin very stony silt loam, Elioak loam, Fluvanna silt loam, Glenelg loam, Louisburg sandy loam, Hazel loam and Manor loam. Table 1 shows selected characteristics of the soil units in the general Rivanna Station area. "Prime Farmland" is included because the Farmland Protection Policy Act (FPPA) regulates federal actions that would convert important farmland to non-agricultural uses. "Important farmlands, including lands identified with soils that are prime, unique, or statewide or locally important farmland, are subject to the provisions of the Farmland Protection Policy Act". The NRCS soil survey indicates whether soils are prime, unique, or statewide or locally important farmland (US Army Fort Belvoir, 2016).

Table 1. Rivanna Area Soil Characteristics.

Map Unit	Map Unit Name	Prime Farmland[1]	Wind Erodibility Group	Erosion Factor K
2B	Albemarle fine sandy loam, 2 to 7 percent slopes	Yes	3	0.24
2C	Albemarle fine sandy loam, 7 to 15 percent slopes	Yes	3	0.24
2D	Albemarle fine sandy loam, 15 to 25 percent slopes	No	3	0.24
3D	Albemarle very stony fine sandy loam, 15 to 25 percent slopes	No	3	0.24
3E	Albemarle very stony fine sandy loam, 25 to 45 percent slopes	No	3	0.24
10	Buncombe loamy sand	No	2	0.05
13C	Catoctin very stony silt loam, 7 to 15 percent slopes	No	5	0.43
13D	Catoctin very stony silt loam, 15 to 25 percent slopes	No	5	0.43
27B	Elioak loam, 2 to 7 percent slopes	Yes	6	0.28
27C	Elioak loam, 7 to 15 percent slopes	Yes	6	0.28
32B	Fluvanna silt loam, 2 to 7 percent slopes	Yes	5	0.37
32C	Fluvanna silt loam, 7 to 15 percent slopes	Yes	5	0.37
34E	Glenelg loam, 25 to 45 percent slopes	No	6	0.28
39E	Hazel loam, 25 to 45 percent slopes	No	5	0.32
47E	Louisburg sandy loam, 25 to 45 percent slopes	No	3	0.17
50E	Manor loam, 25 to 45 percent slopes	No	5	0.28

Notes:
[1] Includes Prime Farmland and Farmland of Statewide Importance

Source: USDA, NRCS Web Soil Survey, 2015.

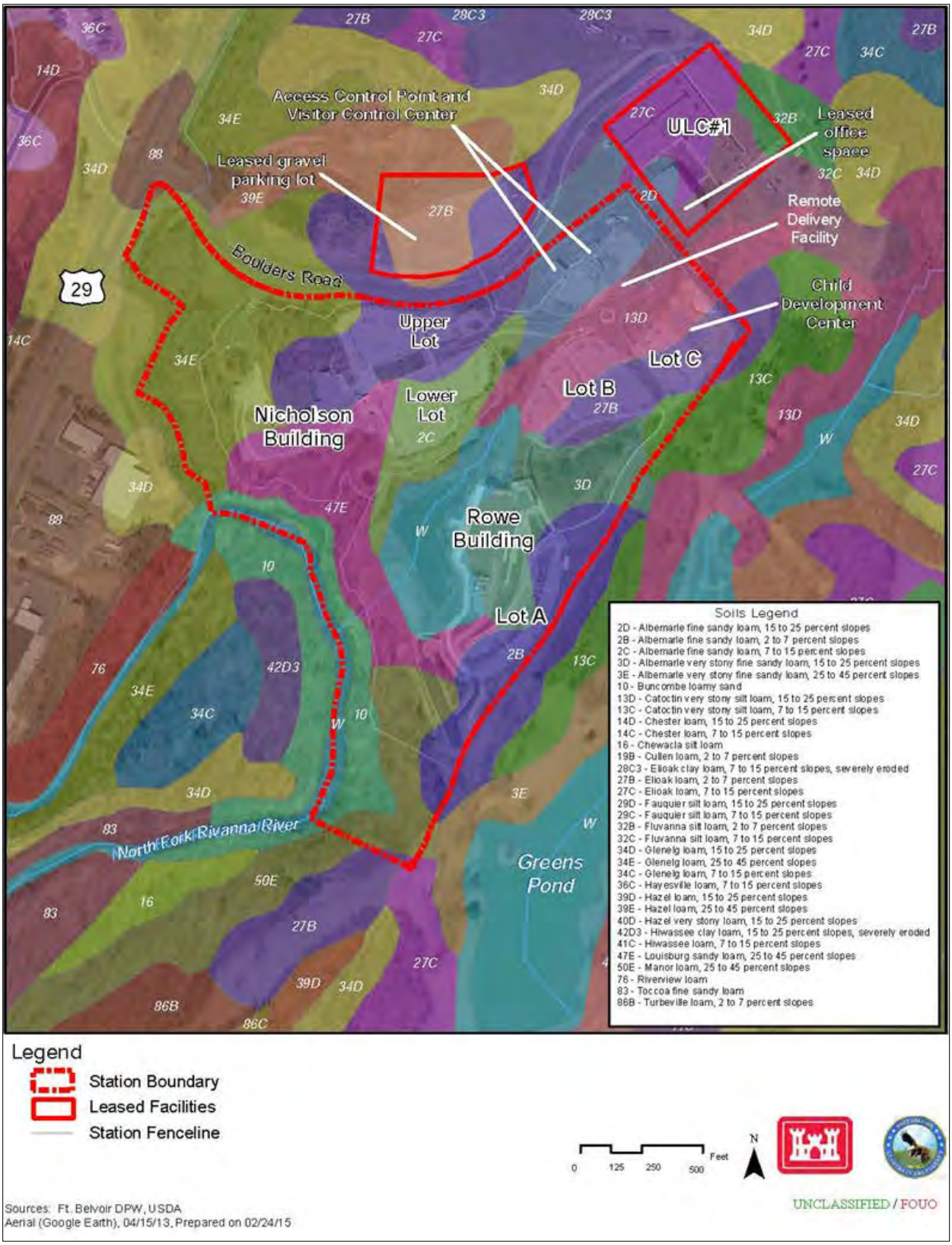

Figure 4. Rivanna Station Area Soils Map.

4.0 RIVANNA STATION WATER RESOURCES

Water resources are protected by the Clean Water Act (CWA), Executive Orders (EO), and state laws and regulations.

4.1 Ground Water

Groundwater can generally be defined as water that occurs beneath the surface of the ground. Generally, groundwater flows underground along hydraulic gradients and discharges into rivers, streams, lakes and the oceans. Recharge of underground aquifers occurs through precipitation that percolates through pervious land covers. Bedrock in Albemarle County consists of mostly igneous and metamorphic rocks, which are very dense and relatively impermeable. Groundwater in Albemarle County is accessed through private wells of varying depth to access fractures in the bedrock, and groundwater quality and availability are relatively consistent across the County. Water-bearing zones are generally encountered within 200 feet of the land surface (US Army Fort Belvoir, 2016).

4.2 Surface Water

The surface waters within Rivanna Station area are shown in Figure 5.

4.2.1 Watersheds

Rivanna Station exists within Albemarle County. Albemarle County lies within the Middle James River Basin of the Chesapeake Bay watershed. Albemarle County is drained by the James River and its three major tributaries; the Rivanna River, Rockfish River, and Hardware River. Rivanna Station is located within the Rivanna River subwatershed, partially bordered by the NFRR. The principal tributaries of the Rivanna River are NFRR, Buck Mountain Creek, Moormans Creek, and Mechum River. The Rivanna River is a tributary of the James River with an approximately 760 square mile watershed in the mountains, foothills and piedmont of Central Virginia (US Army Fort Belvoir, 2016).

4.2.2 Streams

The NFRR is formed in southwestern Greene County by the confluence of the Lynch River and the Roach River, and flows southeast into Albemarle County. Herring Branch runs from north to south nearly parallel to US Route 29, under Boulders Road, and connects to the North Fork Rivanna River (US Army Fort Belvoir, 2016). Part of Rivanna Station borders the NFRR to the south.

4.2.3 Impoundments

Water impoundments on Rivanna Station include four wet retention forebays which discharge into a man-made on-line pond that was created when a dam was constructed on a tributary of the NFRR. As part of the Base Realignment and Closure (BRAC) construction on Rivanna Station, the on-line pond was repaired and retrofitted (with four forebays) to provide stormwater detention capabilities. This pond is herein referred to as the large stormwater pond or wet retention pond. The outfall for the large stormwater pond goes through a riser structure, through a pipe, and into a plunge pool with a rip-rap lined stream channel into the NFRR.

Figure 5. Rivanna Area Surface Waters.

4.3 Wetlands

Section 404 of the CWA, as amended, requires regulation of discharges or fill into Waters of the U. S. (WoUS), including jurisdictional wetlands. EO 11990, *Protection of Wetlands*, requires federal agencies to minimize the destruction, loss, or degradation of wetlands resulting from their actions. Wetlands are areas inundated or saturated by water (surface or ground) and able to support vegetation adept at growing in saturated soils. Jurisdictional wetlands include those connected or adjacent to navigable WoUS. The U.S. Army Corps of Engineers (USACE) has primary responsibility for implementing, permitting and enforcing the provisions of CWA Section 404 (US Army Fort Belvoir, 2016).

WoUS, including wetlands, have been delineated on Rivanna Station and surrounding areas. Rivanna Station WoUS were delineated in 2003 as shown in Figure 6 and a jurisdictional determination was obtained in 2004 (US Army Fort Belvoir, 2008). In 2013, a delineation was completed as part of the Environmental Assessment (EA) for Rivanna Station Real Property Master Plan (RPMP) to determine the boundaries of WoUS adjacent to Greens Pond and confirm the boundaries of wetlands near the Rowe Building. Figure 7 shows the resulting delineation map. Forested, scrub-shrub and emergent wetlands with open water features and non-vegetated stream channels and drainage ways were identified. Typical wetland vegetation included American sycamore (*Platamus occidentalis*), black willow (*Salix nigra*), box elder (*Acer negundo*), tag alder (*Almus serrulata*), jewelweed (*Impatiens capensis*), fall panicgrass (*Panicum dichotomiflorum*), rice cutgrass (*Leersia oryzoides*), and Japanese stiltgrass (*Microstegium vimineum*) (US Army Fort Belvoir, 2016). The jurisdictional determination for the 2013 surveys was issued on 20 January, 2016 by the Western Virginia Regulatory Section of USACE.

4.4 Floodplains

The Federal Emergency Management Agency (FEMA) completed a Flood Insurance Study for Albemarle County in February 2005 and revised the study in April 2014. The purpose of the study was to investigate the existence and severity of flood hazards and to update Flood Insurance Rate Maps (FIRMs). The FIRM that includes the NFRR and Rivanna Station shows the boundaries for the 100-year (representing a 1% chance of flooding every year) and 500-year floodplains (representing a 0.2% chance of flooding every year), as well as the floodway (US Army Fort Belvoir, 2016). The floodway is the channel of a stream, plus any additional floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights (FEMA, 2014). Figure 8 shows the 100-year and 500-year floodplains and the NFRR floodway.

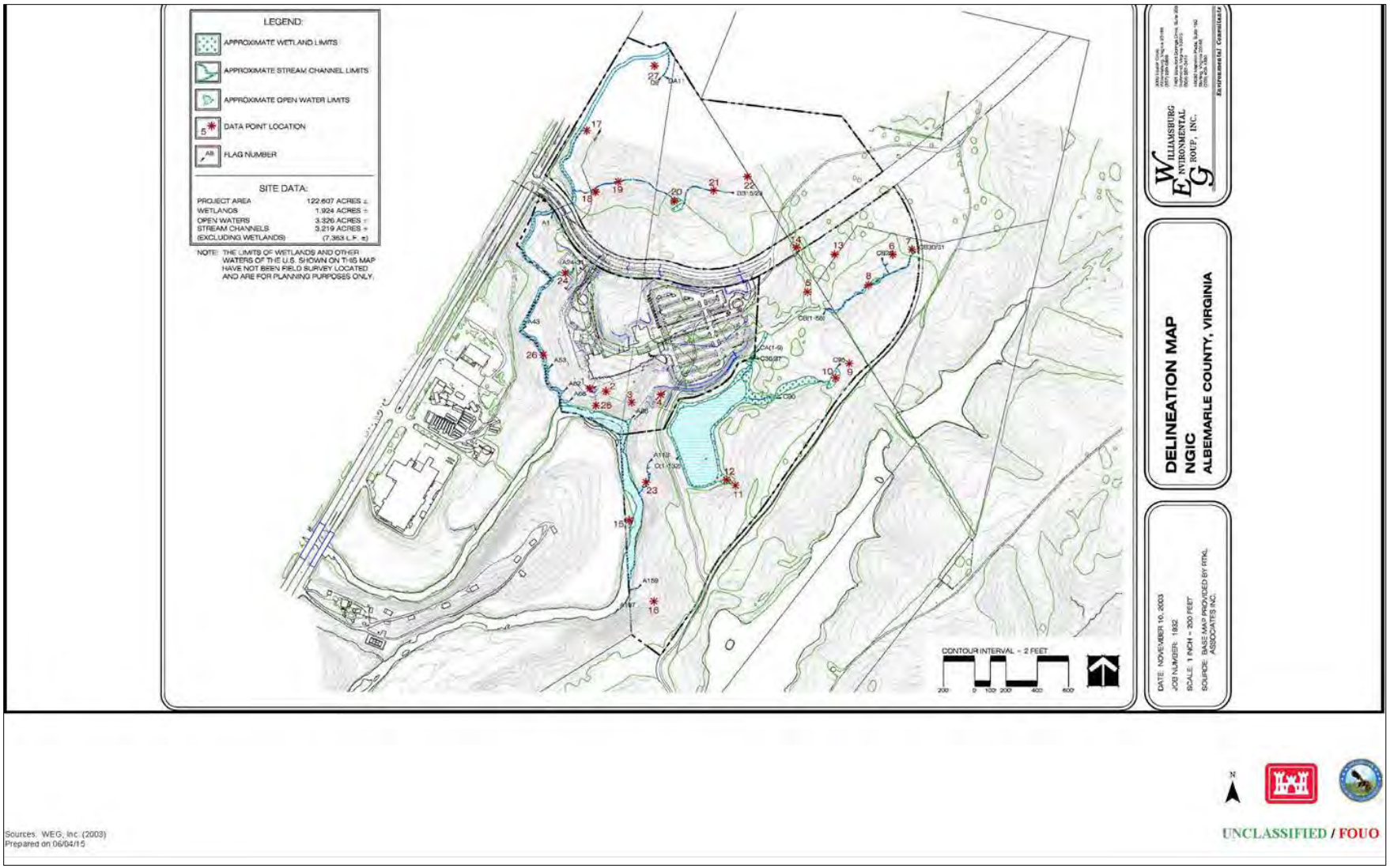

Figure 6. Rivanna Station Jurisdictional Determination 2004.

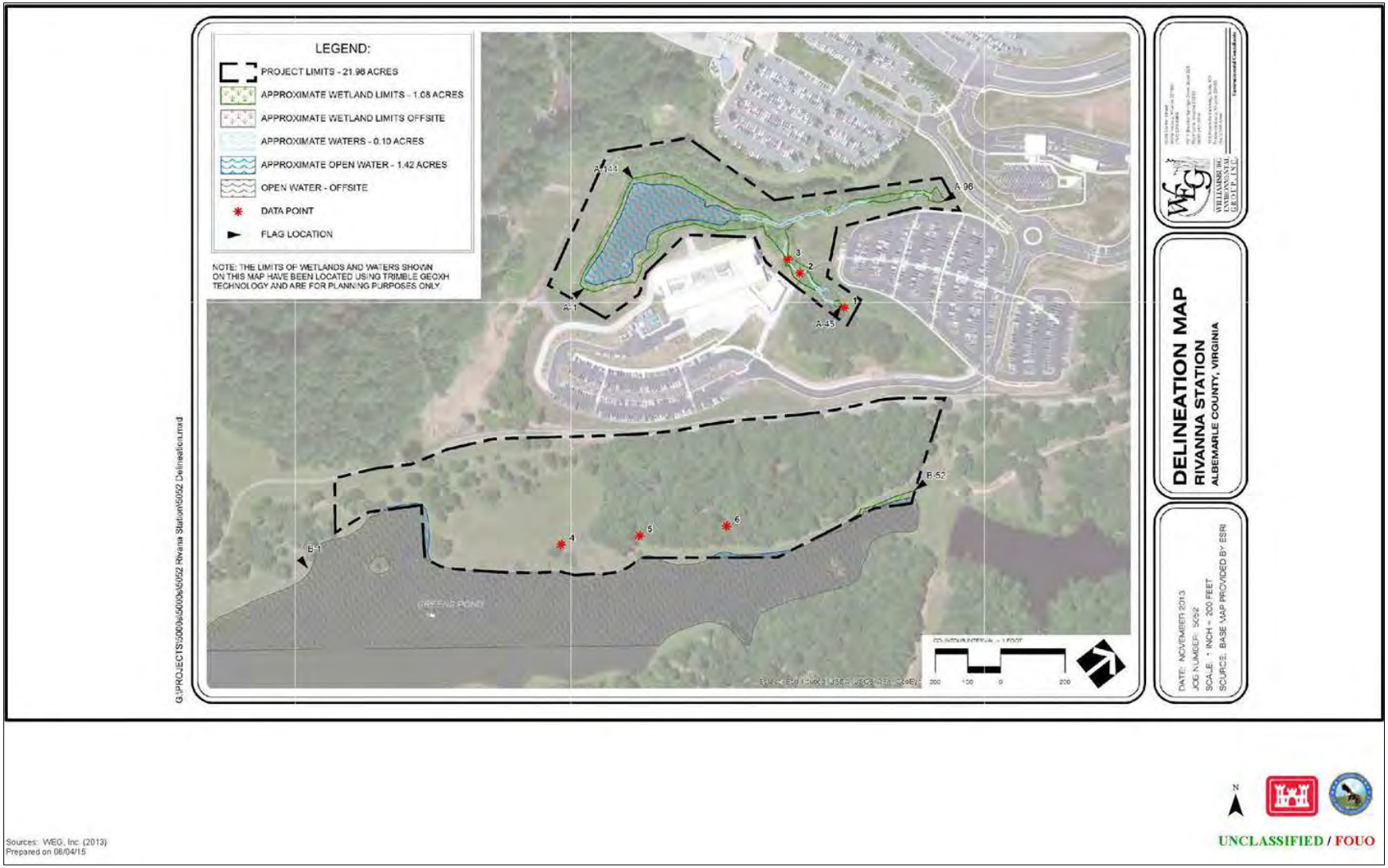

Figure 7. Rivanna Station Jurisdictional Determination 2013.

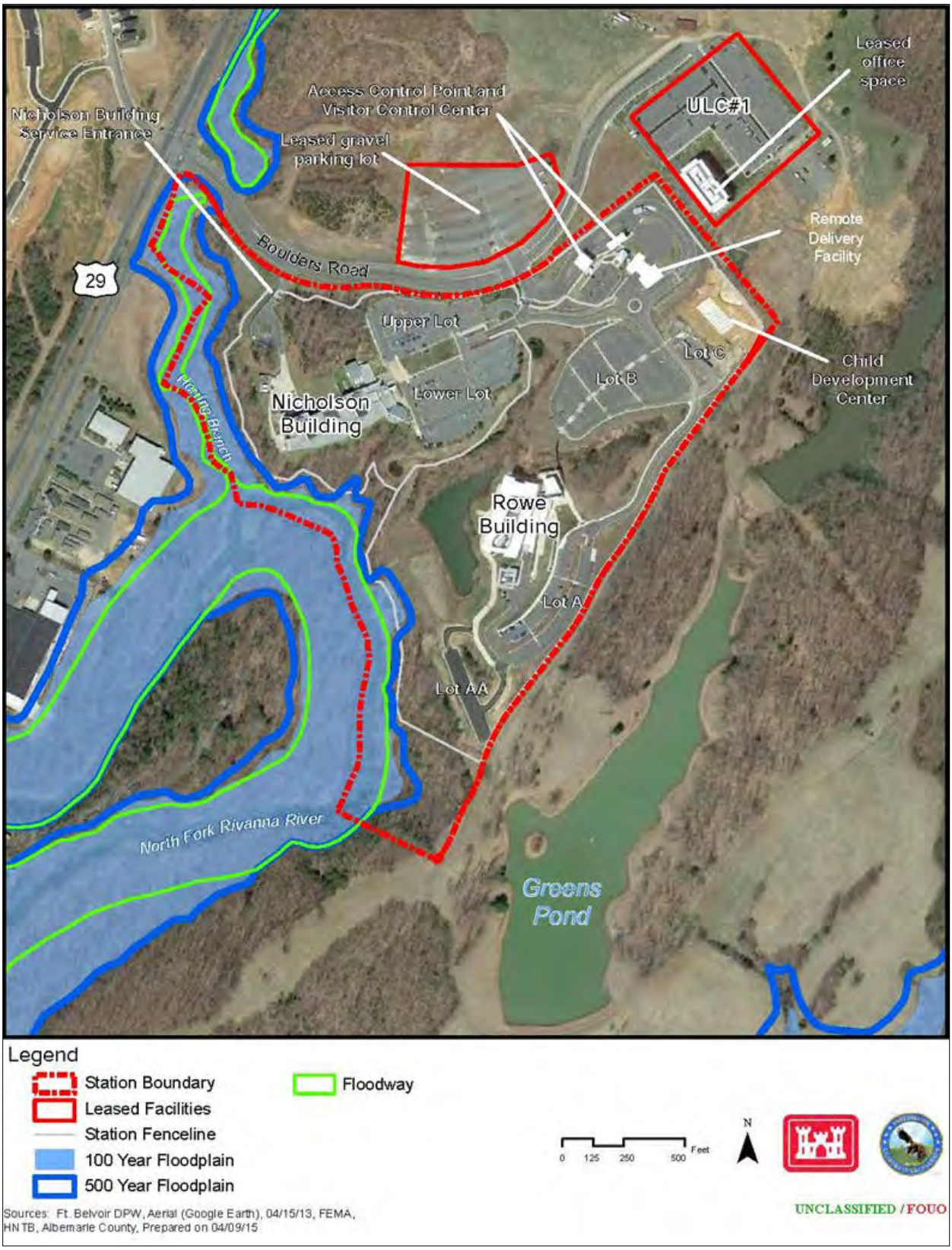

Figure 8. Rivanna Station 100-year and 500-year Floodplains.

5.0 RIVANNA STATION BIOLOGICAL RESOURCES

Biological resources, including plants, wildlife and fish, are managed in accordance with numerous regulations including but not limited to: the Endangered Species Act (ESA) of 1973; the Fish and Wildlife Conservation Act of 1980; Sikes Act; the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended; the Migratory Bird Treaty Act (MBTA); the Bald and Golden Eagle Protection Act (BGEPA); and EO 13112 on Invasive Species.

5.1 Flora

5.1.1 Terrestrial Plant Communities

The developed areas of Rivanna Station include improved and semi-improved grounds, primarily as landscaping to the existing facilities. The dominant vegetation in the developed areas includes a mix of turf grasses and ornamental trees and shrubs along site peripheries, in parking lot islands, and in association with existing buildings. These areas have been landscaped for enhanced aesthetics and shade (US Army Fort Belvoir, 2008).

The undeveloped areas of Rivanna Station are typical of the region, ranging from areas of undisturbed mature forest to grassy habitat succeeding to old-field, with transition areas between. The forest species include tulip poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*) and white oak (*Q. alba*) with red maple (*Acer rubrum*) and sycamore (*Platanus occidentalis*) found in the wetlands and along the floodplain (US Army Fort Belvoir, 2008).

A summer habitat assessment was done in support of surveys conducted for the Indiana bat. This assessment found that the forested areas are dominated by an overstory of white oak, northern red oak, tulip poplar, black oak (*Q. velutina*), sugar maple (*A. saccharum*), and beech. Sub-dominants included white ash (*Fraxinus americana*), black gum (*Nyssa sylvatica*), mockernut hickory (*Carya tomentosa*), southern red oak (*Quercus falcata*), and red maple (Beverly 2008).

5.1.2 Aquatic and Wetland Plant Communities

Typical wetland vegetation in the Rivanna station area includes: American sycamore, black willow, box elder, tag alder, jewelweed, fall panicgrass, rice cutgrass (*Leersia oryzoides*), and the highly invasive Japanese stiltgrass (*Microstegium vimineum*) (US Army Fort Belvoir, 2016).

5.1.3 Invasive Species

In support of alternative actions listed in the Rivanna Station RPMP EA, a 14-acre adjacent property to Rivanna Stations was surveyed. The flora species list included Japanese stiltgrass and Japanese honeysuckle (*Lonicera japonica*). Both of these species are listed on the Virginia Invasive Plant Species List and are ranked as exhibiting high levels of invasiveness to natural communities and native species (Heffernan, 2014).

5.2 Fauna

Integrated Natural Resources Management Plans (INRMPs) and the National Environmental Policy Act (NEPA) process constitute the principal tools for effectively integrating mission needs with ecosystem-based natural resource management. INRMPs and NEPA environmental analyses also serve to ensure compliance with applicable natural resources related laws, executive orders, and regulations. For DoD construction, operations, and training activities, the INRMP and NEPA processes provide valuable baseline information to help planners avoid or minimize adverse effects on sensitive species and habitats. These processes also provide information useful in conducting effective regulatory consultations and in otherwise assuring that potential natural resource impacts, viable alternative courses-of-action, and reasonable mitigation options are identified and considered early in the development, design, and siting approval processes for a proposed action.

5.2.1 Fish

The 1996 amendments of the MSFCMA mandates that federal agencies conduct an Essential Fish Habitat (EFH) consultation with the National Oceanic Atmospheric Administration (NOAA) -National Marine Fisheries Service (NMFS) regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (Biological Solutions 2008).

In support of the JUIAF construction and associated projects, an EFH Assessment was conducted in 2008. The assessment describes the impacts of the Rivanna projects on EFH and NOAA-Trust Resource Species for the NFRR that is adjacent to the southern boundary. EFH designations provided by the Habitat Conservation Division EFH webpage (http://www.nero.noaa.gov/hcd/index2a.htm), Guide to Essential Fish Habitat Designations in the Northeastern United States indicate the project area is located outside of designated EFH areas (Biological Solutions 2008).

Although Rivanna is located outside of designated EFH areas, consultation with NOAA-NMFS may also be required if the proposed action results in adverse impacts to other NOAA-Trust Resources, such as anadromous fish, shellfish, crustaceans, or their habitats. NOAA-Trust Resources that are likely to be found at the project area include American eel (*Anguilla rostrate)* (herein called eel). Although it is possible for additional NOAA-Trust Resources such as american shad (*Alosa sapidissima),* blueback herring (*Alosa aestivalis),* and alewife (*Alosa pseudoharengus),* to reach the NFRR during annual spawning migrations, distribution maps provided by Jenkins and Burkehead (1993), indicate the presence of these species is unlikely (Biological Solutions 2008).

The 2008 surveys did confirm presence of eels in the NFRR. However at the time, the actions described (JUIAF construction and associated projects) did not anticipate any short-term or long-term effects as a result of indirect impacts on sub-adult, adult, and/or spawning adult lifecycles for eel or their prey species.

During mussel surveys on the NFRR and Herring Branch in 2013, several aquatic species were observed, including fish, mussels, aquatic snails, and non-native freshwater clams (*Corbicula fluminea)*. Common fish observed during the survey included Roanoke darter (*Percina roanoka*), Johnny darter (*Etheostaoma nigrum)*, blacktip jumprock (*Moxostoma cervinum*), northern hogsucker (*Hypentelium nigricans*), central stonerollers (*Campostoma anomalum michauxi*), fallfish (*Semotilus corporalis*) and largemouth bass (*Micropterus salmoides*) (US Army Fort Belvoir, 2016).

5.2.2 Wildlife

Numerous terrestrial wildlife species occur within the Rivanna Station area. The most common species include white-tailed deer (*Odocoileus virginianus*), eastern wild turkey (*Meleagris gallopavo*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), eastern gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), long-tailed weasel (*Mustela frenata*), black bear (*Ursus americanus*), and groundhog (*Marmota monax*). Amphibians and reptiles such as snakes, lizards, salamanders, frogs, and turtles are also found to occur in the vicinity of the project area. Numerous species of migratory songbirds nest in the area, and birds of prey and waterfowl are also commonly seen (US Army Fort Belvoir, 2016).

5.2.3 Species of Management Interest

DoD installations must ensure that INRMPs and NEPA analyses adequately address migratory bird management and the potential impacts of proposed military activities—readiness and non-readiness related alike—on migratory birds. The Military Readiness Rule (50 CRF Part 21.15) authorizes, with certain limitations, the incidental take of migratory birds during military readiness activities. Nonetheless, the Armed Forces must give appropriate consideration to the protection of migratory birds when planning and executing military readiness activities, but not at the expense of diminishing the effectiveness of such activities. Moreover, this requirement pertains to all military readiness activities,[1] not just those that may result in a significant adverse effect on a population of a migratory bird species (*see* Preamble to Final Rule on the Take of Migratory Birds by the Armed Forces, 72 Fed. Reg. 8931-8950 (February 28, 2007)).

Migratory birds are protected by a variety of laws and regulations, including the MBTA (16 U.S.C. 703-712) and the BGEPA. Any actions that result in the take (i.e., to "pursue, hunt, shoot, wound, kill, trap, capture, or collect" 50 C.F.R. § 10.12) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (USFWS). There are no

[1] "Military Readiness Activity" includes 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. It does not include (a) routine operation of installation operating support functions, such as: administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; morale, welfare, and recreation activities; shops; and mess halls, (b) operation of industrial activities, or (c) construction or demolition of facilities listed above. *See* Pub. L. 107-314, §315(f) and 50 CFR § 21.3.

provisions that allow for the direct, indirect, or incidental take of migratory birds, except in a few instances (e.g., scientific collection permits) where permits are obtainable. Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

The USFWS Information, Planning, and Conservation System (IPaC) tool (accessed 11/21/2016) identified 17 species on the Birds of Conservation Concern list in the vicinity of Rivanna Station. The USFWS Birds of Conservation Concern (BCC) (2008) report identifies species, subspecies, and populations of all migratory nongame birds that are of conservation or management concern due to low numbers, declining population trends, or recent delisting. For the Rivanna Station area of Virginia this list includes the species identified in Table 2. The last column in the table addresses the probability of each species occurring on Rivanna Station based on ecological requirements and habitat available on the Station.

Partners in Flight (PIF) is a network of more than 150 partner organizations engaged in all aspects of landbird conservation from science, research, planning, and policy development, to land management, monitoring, education, and outreach. PIF utilizes the best, most up-to-date science to assess the vulnerability of all landbirds, PIF compiled the 2016 Species of Concern "Watch List" (WL), which identifies 86 species of highest conservation concern. All of these birds require immediate and coordinated actions across their full range and life cycles to reduce threats, reverse declines, and prevent future extinctions.

Bird Conservation Regions (BCRs) are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. Rivanna Stations falls within BCR 29, Piedmont, Figure 9. The Piedmont BCR is often regarded as a transition area between the mountains and valleys of the Appalachian region and the relatively low lying and flat coastal plain (Watson 2014). The species on the PIF Watch List that occur within BCR 29 are listed in Table 2.

The DoD has intrinsic mission and conservation issues, both of which require due diligence to laws and regulations to protect mission capabilities. Thus DoD Partners in Flight created its own list of *Mission Sensitive Species (www.dodpif.org)* to provide focus on those species most relevant to protecting the DoD missions. This list highlights bird species that occur on DoD lands and are at risk of becoming listed as threatened or endangered under the federal ESA, if current populations trends continue. The purpose of this list is to help DoD resource managers better prioritize monitoring and management efforts on those species (and their habitats) having the highest potential to impact the military mission should they become Federally listed. The list helps installations prioritize monitoring programs and NEPA documents and guides the development of conservation actions to support EO 13186 (*Responsibilities of Federal Agencies To Protect Migratory Birds*), the associated Memorandum of Understanding with USFWS, and the Final Migratory Bird ("Readiness") Rule. Table 2 lists the Mission Sensitive Species (MSS) that could occur at Rivanna Station with note to which may actually occur.

To date, official planning-level avian surveys have not been conducted in the Rivanna Station area.

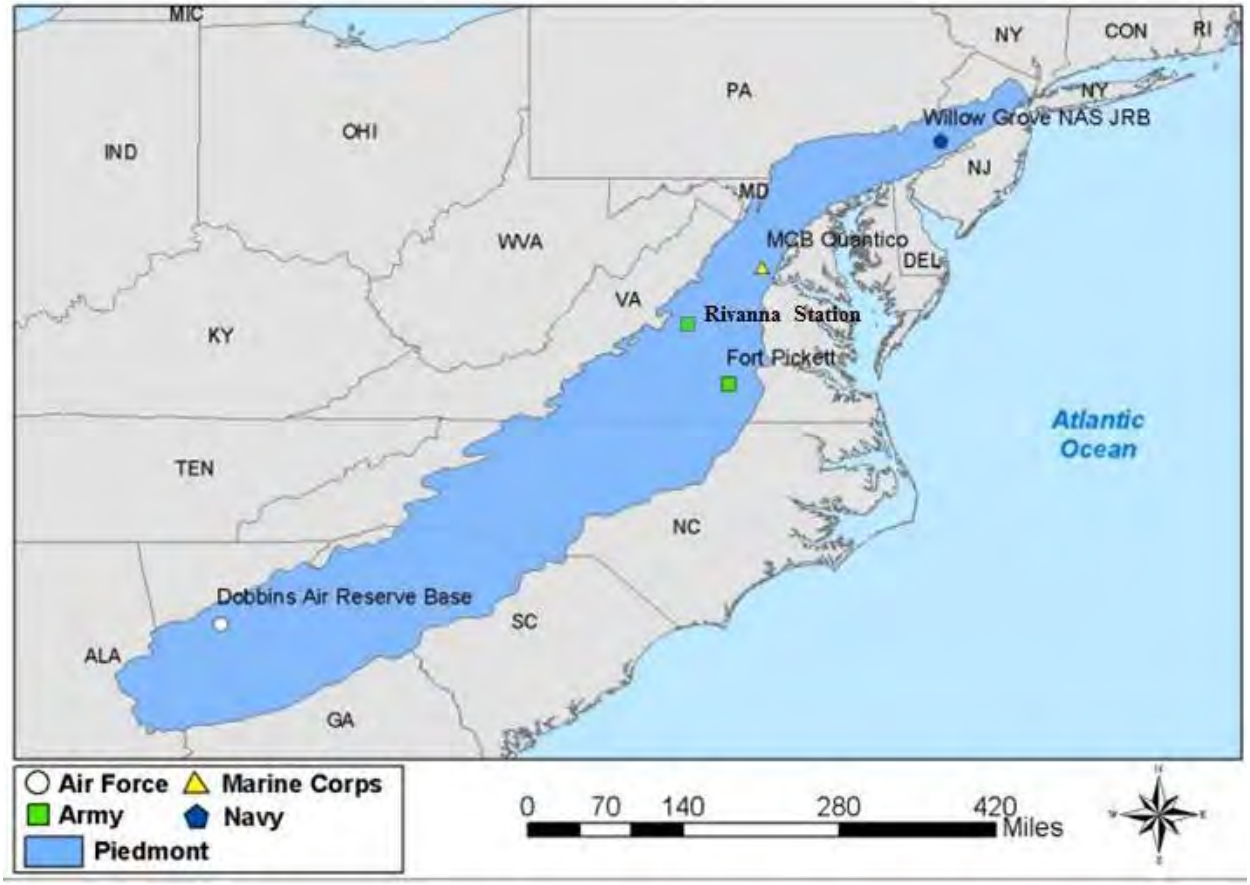

Figure 9. North American Bird Conservation Initiative, Bird Conservation Region Number 29.

Table 2. Rivanna Station Birds of Management Concern						
Common Name	**Scientific Name**	**FWS[1] BCC**	**PIF[2] WL**	**DoD[3] MSS**	**Season**	**Occurrence Probability[4]**
Bald Eagle	*Haliaeetus leucocephalus*	*			Year-round	Possible, known in county
Black-billed Cuckoo	*Coccyzus erythropthalmus*	*		*	Breeding	Not likely, known in county
Blue-winged Warbler	*Vermivora pinus*	*		*	Breeding	Not likely, known in county
Cerulean Warbler	*Dendroica cerulea*	*		*	Breeding	Not likely, known in county
Fox Sparrow	*Passerella iliaca*	*			Wintering	Not likely, known in county
Kentucky Warbler	*Oporornis formosus*	*	*	*	Breeding	Not likely, known in county
Loggerhead Shrike	*Lanius ludovicianus*	*			Year-round	Not likely, known in county
Peregrine Falcon	*Falco peregrinus*	*			Breeding	Not likely, known in county
Pied-billed Grebe	*Podilymbus podiceps*	*			Breeding	Possible, known in county
Prairie Warbler	*Setophaga discolor*	*	*	*	Breeding	Possible, known in county
Prothonotary Warbler	*Protonotaria citrea*	*	*	*	Breeding	Not likely, known in county
Red-headed Woodpecker	*Melanerpes erythrocephalus*	*	*	*	Year-round	Possible, known in county
Rusty Blackbird	*Euphagus carolinus*	*		*	Wintering	Not likely, not in county
Short-eared Owl	*Asio flammeus*	*			Wintering	Not likely, possible in county
Willow Flycatcher	*Empidonax traillii*	*			Breeding	Possible, known in county
Wood Thrush	*Hylocichla mustelina*	*	*	*	Breeding	Possible, known in county
Worm Eating Warbler	*Helmitheros vermivorum*	*			Breeding	Possible, known in county
Grasshopper Sparrow	*Ammodramus savannarum*			*	Breeding	Not likely, known in county
Eastern Whip-poor-will	*Caprimulgus vociferus*		*		Breeding	Not likely, known in county

[1]FWS BCC = U.S. Fish and Wildlife Service, Birds of Conservation Concern 2008. Note - Bird list generated from IPaC.
[2]PIF WL = Partners In Flight, Watch List, Bird Conservation Region 29 Piedmont 2016.
[3]DoD MSS = Department of Defense Mission Sensitive Species DRAFT 2017.
[4]Occurrence Probability = Derived from National Geographic, Field Guide to Birds of North America, Sixth Edition, Range maps and local expertise.

5.2.4 Endangered, Threatened and At-Risk Species

Proposed, Candidate, Threatened, and Endangered Species are managed by the Endangered Species Program of the USFWS. Section 7 of the ESA requires Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

Currently only two species that may be present at Rivanna Station are listed: one clam, James spinymussel (*Pleurobema collina*) is listed as endangered, and one mammal, northern long-eared bat (*Myotis septentrionalis*), is listed as threatened. Neither species has designated critical habitat within the Rivanna Station area.

5.2.4.1 Spinymussel Surveys

The James spinymussel is a freshwater mussel that feeds on plankton collected from water that is passed over its gills. Suitable habitat for this species includes free-flowing streams with a variety of flow regimes and water depths (USFWS 2016).

The first spinymussel surveys were conducted in 2008. On behalf of the DoD (Fort Belvoir), Paculli, Simmons & Associates, Ltd. subcontracted the Virginia Department of Conservation and Recreation Division of Natural Heritage (DCR-DNH) to conduct a survey for rare freshwater mussels along a 1 kilometer (km) section of the NFRR just east of U.S. Route 29 in Albemarle County, Virginia. The nearest recent records (three sites) for the federally endangered James spinymussel in the NFRR drainage are approximately 2.4, 8.8, and 9.9 km upstream respectively, of Rivanna Station. The section of the NFRR that was surveyed ranged from approximately 250 m upstream (38° 09· 17" N, 78° 25' 0"· W) to 900 m downstream (38° 08' 55" N. 78° 25' 16"' W*)* of the outfall of the stormwater retention pond.

No endangered or threatened freshwater mussels were found during the survey. Potentially suitable habitat for rare mussels is present within the surveyed reach of the NFRR, especially in riffle habitats, but no live or fresh dead specimens, or shells (recent or relict) or shell fragments, of any of the state or federally listed species were found during the 2008 survey (Virginia DCR-DNH, 2008).

Another mussel survey was conducted in August 2013 to survey two stretches of NFRR and Herring Branch for the presence of the James spinymussel. Recent work by Ostby and Angermeier (2012) identified substantial populations of James spinymussel approximately 7 km upstream of JUIAF in Swift Run. The survey was conducted in anticipation of requests for mussel surveys by the USFWS and the Virginia Department of Game and Inland Fisheries (VDGIF). The area surveyed extended 800 downstream of the JUIAF southern boundary on the NFRR extending from 200 m upstream of the western border and 850 m reach extending downstream in the NFRR from the outfall of Greens Pond (Daguna 2013).

One occurrence of the endangered mussel was identified during the survey approximately 550 m downstream of the southern border of Rivanna Station in the NFRR. Based on this finding and results of previous studies, it was concluded that the James spinymussel is present in the NFRR near Rivanna Station (Daguna 2013).

5.2.4.2 Northern Long-eared Bat Surveys

The northern long-eared bat roosts singly or in colonies underneath bark or in crevices of live and dead trees during the summer. During the winter, the bats hibernate in caves and mines. Female northern long-eared bats roost in maternity colonies in the summer months, and typically give birth between late May and late July (USFWS 2016). The northern long-eared bat is impacted by the disease white-nose syndrome (WNS). Due in large part to the impacts of WNS on the population, the northern long-eared bat is now listed as a threatened species under the ESA (Daguna 2013). Rivanna Station is within the WNS Buffer Zone for the northern long-eared bats. This zone identifies the portion of the range of the northern long-eared bat within 150 miles of the boundaries of U.S. counties or Canadian districts where WNS or the associated fungus has been detected (50 Code of Federal Regulations (CFR) Part 17).

The northern long-eared bat is found in similar habitats to the Indiana Bat, and is known to be even less selective of habitat. Therefore, the area surveyed for the Indiana Bat also contains summer habitat suitable for the northern long-eared bat (US Army Fort Belvoir, 2016).

5.2.4.3 Indiana Bat Surveys

In 2008, in response to a number of construction projects that affected forested area at Rivanna Station, the USFWS requested a survey to assess the status of the federally endangered Indian bat (*Myotis sodalis*). Paciulli, Simmons & Associates, Ltd. contracted Apogee Environmental Consultants, Inc. to conduct the assessment for Indiana bat at Rivanna Station.

Apogee Environmental Consultants, Inc. conducted a summer habitat assessment. This assessment focused on flora community type and structure with special attention to large tree species and snags providing roost habitat. Many trees were observed within the Rivanna area that had the necessary criteria to be primary and/or alternate roost trees. Potential roost trees included both snags and large trees that were widely scattered. In addition to the overstory trees, surveys by foresters during 2008 found 50 snags on approximately half the Rivanna Station (Beverly 2008).

Mist net surveys also were conducted in accordance with USFWS protocol. A total of three bats of two species were captured during the project. These included two eastern red bats (*Lasiurus borealis*) and one eastern pipistrelle (*Perimyotis subflavus*). No endangered bats were captured during the eight net nights of effort.

Winter habitat assessments also were completed. This assessment consisted of surveying for caves and evaluating suitability for Indiana bats. This assessment concluded that there was no potential habitat within the project area.

5.2.5 State Listed Species

The Virginia Fish and Wildlife Information Service (VaFWIS) was consulted (accessed 10/26/2016) in order to assess state listed species in the Rivanna Station area. Table 3 details the state listed species that may occur within Rivanna Station.

Table 3. Rivanna Station State Listed Species		
Common Name	**Scientific Name**	**State Status**
Little Brown Bat	*Myotis lucifugus lucifugus*	State Endangered
Tri-colored Bat	*Perimyotis subflavus*	State Endangered
Brook Floater	*Alasmidonta varicosa*	State Endangered
James Spinymussel	*Pleurobema collina*	State Endangered
Northern Long-eared Bat	*Myotis septentrionalis*	State Threatened
Migrant Loggerhead Shrike	*Lanius ludovivianus migrans*	State Threatened
Loggerhead Shrike	*Lanius ludovicianus*	State Threatened
Peregrine Falcon	*Falco peregrinus*	State Threatened
Appalachian Grizzled Skipper	*Pyrgus wyandot*	State Threatened
Atlantic Pigtoe	*Fusconia masoni*	State Threatened
Green Floater	*Lasmigona subviridis*	State Threatened

Freshwater mussel surveys were completed in the Rivanna Area in both 2008 and 2013. Collectively the surveys covered areas in the NFRR extending from 800 m downstream of the JUIAF southern boundary to 200 upstream of the western border and an 850 m reach extending downstream in the NFRR from the outfall of Greens Pond.

The Atlantic pigtoe is a medium-sized freshwater mussel that prefers clear, swift waters with gravel and or sand and gravel substrates. Coordination undertaken for the 2008 EA indicated that the Atlantic pigtoe has been documented in the NFRR in the vicinity of Rivanna Station. However, no Atlantic pigtoe were identified during the August 2013 mussel survey (US Army Fort Belvoir, 2016).

According to the VaFWIS, the brook floater requires fast-flowing, clean water in substrates that contain relatively firm rubble, gravel, and sand substrates swept free from siltation. They are usually found buried in the substrate in shallow riffle and shoal areas. The green floater is able to occupy very small creeks and streams, places where other mussels are not often found.

The 2008 surveys by Virginia Department of Conservation and Recreation (VDCR) found no endangered or threatened freshwater mussels. In fact, they found only two native freshwater mussel species, five live specimens and one shell of notched rainbow (*Villosa constricta)*and one shell of creeper (*Strophitus undulates)* (VDCR, 2008).

Daguna Consulting conducted over a 22 person-hour survey effort covering at least 10,000 m^2 of the NFRR, and observed one live specimen of *P. collina*, 11 live *Strophitus undulatus* and 43 live *Villosa constricta*. No mussels were observed in Herring Branch. The one live *P. collina* was observed in the upstream reach approximately 550 m downstream of the JUIAF southern border.

Potentially suitable habitat for rare mussels is present within the surveyed reach of the NFFR, especially in riffle habitats, but no live or fresh dead specimens, or shells (recent or relict) or shell fragments, of any rare freshwater mussel species (Atlantic pigtoe, green floater, James spinymussel, Virginia pigtoe, and yellow lance) were found during this survey. Perhaps past

siltation or pollution events or some other factor(s) have reduced the water quality of this section of the river, thus accounting for the apparent absence of rare mussels and the low density of other native mussel species (VDCR, 2008).

Terrestrial invertebrate surveys have not been conducted at Rivanna. The Appalachian grizzled skipper is a Virginia state threatened species. The VaFWIS does not list a preferred habitat, land use, or environmental associations making it difficult to predict presence at Rivanna. However other sources, like Pennsylvania Natural Heritage list preferred habitat of semi-open shale slopes with sparse herbaceous vegetation and tend to be surrounded by scrubby oak or oak-hickory woodlands, often with a component of Virginia pine (*Pinus virginiana*). Occupied sites are always in proximity (within 30 m or 100 ft) of densely wooded areas. Adults seldom occur more than about 30 m from woods even if the hostplant, typically Canada cinquefoil, extends far out in the open. The grizzled skipper is extremely vulnerable to gypsy moth spraying.

As discussed above, in 2008, Apogee Environmental Consultants, Inc. conducted mist netting to assess bats species within the Rivanna area. Only two species were found at that time the eastern red bats (*Lasiurus borealis*) and eastern pipistrelle (*Perimyotis subflavus*) (now known as tri-colored bat) (Paculli, Simmons and Associates Ltd., 2008).

The three state listed bird species, peregrine falcon, loggerhead shrike (both resident and the migratory subspecies) are not likely to occur within Rivanna based on available habitat. Peregrine falcons in this area of their range would typically be found in a broad array of habitats, including urban, barrier islands, seacoasts, lake edges, or mountain ranges (Clayton et al 2002). Loggerhead shrikes prefer open country with short vegetation. Breeders usually settle near isolated trees or large shrubs. In Virginia, highest-quality breeding habitat consists of short grass, particularly active pastures with many perches (Yosef 1996). Although none of the above avian species are likely to occur on Rivanna Station official surveys for these or other species have not occurred.

6.0 RIVANNA STATION CULTURAL RESOURCES

A number of cultural resource surveys have been undertaken in and around the Rivanna Station area. As a result, only two archaeological sites were identified and subsequently determined not eligible for National Register of Historic Places (NRHP) listing. The State Historic Preservation Office (SHPO) concurred with Fort Belvoir's findings that the sites were not eligible. Additionally, no further archaeological investigations of the Rivanna Station are recommended (US Army Fort Belvoir, 2016).

7.0 RIVANNA STATION MANAGEMENT PRESCRIPTIONS

7.1 Natural Resources Management

7.1.1 Stormwater Management

At Rivanna Station, the stormwater runoff from predominantly impervious surfaces generally flows into stormwater conveyance structures and engineered systems. The Nicholson Building’s

stormwater flows into either one of two dry stormwater ponds that are located on either side of the building. These two dry ponds flow directly into the NFRR. The remainder of Rivanna Station, which includes the Rowe Building, Lower Parking Lot, Parking Lot A, Parking Lot AA, Parking Lot B, Parking Lot C, the CDC, the RDF, the VCC and the ACP's stormwater flow into one of four forebay's which drain into the large on-line stormwater management pond (wet retention). This large on-line stormwater pond then discharges through a riser structure, through a pipe, and into a plunge pool with a rip-rap lined stream channel into the NFRR. Vegetated swales, forebays, and stormwater management ponds act to filter sediment, nutrients and pollutants, reduces the velocity of runoff prior to the discharge into the NFRR.

For the Nicholson Building, the stormwater management system collects rainwater from building roof drains and the water flows through vegetated swales, into one of the two dry ponds and discharges into the NFRR. Sheet flow from the paved Upper Parking Lot and a small portion of the Lower Parking Lot are conveyed via grassed swales and storm water inlets to the small Stormwater pond (dry pond) located north of the large stormwater management pond (wet retention pond) then to the North Fork Rivanna River (US Army Fort Belvoir, 2016).

For buildings and paved areas located in the northeastern portions of the site, stormwater is collected via inlets and stormwater pipes and directed towards a vegetated swales which drain into one of four wet forebays which drains into the on-line stormwater management pond (wet retention). Stormwater from the ULC #1 and future phases are also piped and drain into these four wet forebays which drains into the on-line stormwater management pond (wet retention).

Parking lots for the Rowe Building and stormwater from the Rowe Building are also collected and piped into vegetated swales that drain into one of four wet forebays which drains into the on-line stormwater management pond (wet retention). Outflow from the wet retention pond drains into a riser structure which discharges through the dam into a plunge pool with a rip-rap lined stream channel into the NFRR.

Required stormwater infrastructure management includes:

- Examination of the embankment (of the stormwater basin) at a minimum of every six months to remove trees located within 25' of the embankment.
- Fertilization of the embankment once every three years.
- The principle spillway shall be examined at a minimum of every six months for deterioration and debris that shall be removed as necessary.
- The emergency spillway shall be inspected once per year or after any storm that engages the spillway.
- The reservoir drain should be exercised at least once each year to ensure that it is in operable condition.
- Debris shall be removed from the pond perimeter and embankments of ponds as necessary.
- The downstream channel shall be maintained in its present natural condition.

7.1.2 Wetlands Management

All reaches into the stormwater management basin (all four forebays) are delineated streams/wetland areas that are monitored and maintained by the installation. The primary management activities include continuing to avoid and minimize impacts to wetland resources and maintain existing wetlands and WoUS as required to meet the minimum standards as stipulated; as well as to update the baseline extent of wetlands found at Rivanna Station. Updating of the WoUS would include a field visit at a minimum frequency of once per year in order to meet the management objectives and strategies listed in the Wetlands Section of the US Army Garrison Fort Belvoir INRMP.

Aside from federal regulations additional state conditions applies to Rivanna Station. The county adopted the Chesapeake Bay Protection Ordinance and as such, requires all property owners to follow the Chesapeake Bay Preservation Act (9 VAC 25 Chapter 830) which affords certain streams a 100 foot buffer.

7.1.3 Wildlife Management

All federal and state fish and wildlife laws and regulations described and discussed in the Biological Resources section will drive wildlife management on Rivanna Station. These laws include but are not limited to: MSFCMA, the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Endangered Species Act.

It is critical that Rivanna utilize survey data to determine species presence or no detection and create management prescriptions of sensitive and species of concern.

7.1.4 Vegetation Management

All federal, state, and installation vegetation policies and regulations applicable to main post apply to Rivanna Station, as well. One consequence of this policy is that the stipulations of the Fort Belvoir Tree Policy Letter must be observed for all construction projects at Rivanna Station.

The Memorandum of Instruction — Northern Long-eared Bat Protection on Fort Belvoir also limits tree cutting. The memo states that the Programmatic Consultation (with USFWS) establishes a time-of-year restriction (TOYR) prohibiting all tree cutting or clearing of trees 3 inches or greater in diameter at breast height from 15 April through 15 September annually. An exception is possible for trees that pose a hazard to personnel or property, and for removal of individual non-hazardous trees. Such removals must be coordinated through the Fort Belvoir Directorate of Public Works (DPW). For those exceptions, Fort Belvoir must survey and document the absence of northern long-eared bat prior to authorizing removal of any trees during the TOYR period. Individual non-hazardous trees cannot be removed, if northern long-eared bat is present. Hazardous trees may be removed, but Fort Belvoir must initiate emergency consultation with FWS for trees to be removed during the TOYR period, if northern long-eared bat is present.

7.1.5 Pest Management

All pest and nuisance wildlife management is handled through a contract managed by Rivanna Station.

8.0 RIVANNA STATION PROJECTS

8.1 Current/On-going Projects

8.1.1 Cavity Nesting Bird Boxes

Rivanna Station contains 8 cavity-nesting bird boxes along the Bluebird Trail. The boxes were installed in 2001, by the Virginia Bluebird Society (VBS). The VBS was established in 1996 with an aim to provide much needed nesting homes for bluebirds as their natural nesting sites (tree cavities) were in short supply. While the boxes are specifically designed to attract bluebirds, other native cavity nesters are welcomed. The boxes are maintained and monitored, by a volunteer, on a weekly basis during the breeding season (early April to mid-August). In 2015, 51 bluebirds, 6 Carolina chickadees, and 22 tree sparrows fledged from the 8 nest boxes at Rivanna Station.

8.2 Future Projects

8.2.1 Conduct Planning-Level Avian Surveys

Conduct a survey, or inventory, of migratory bird species on Rivanna Station. Ensure completion during the breeding season to provide baseline information, including abundance and distribution information. The DoD Coordinated Bird Monitoring Plan (US Geological Survey Open-File Report 2010–1078) can be used as a guide to prioritize seasons and monitoring techniques. Use the survey results to create a list of migratory bird species on the installation property. In that species list, articulate the habitat(s) where the species occur. Survey results will inform future INRMP updates, objectives, and associated actions.

8.2.2 Conduct Planning-Level Bat Surveys

Conduct a survey, or inventory, of bats on Rivanna Station. Ensure completion during the breeding season to provide baseline information, including abundance and distribution information. The USFWS guidelines can be used to prioritize seasons and determine appropriate monitoring techniques. Use the survey results to create a list of bat species on the installation property. In that species list, articulate the habitat(s) where the species occur. Survey results will inform future INRMP updates, objectives, and associated actions.

8.2.3 Conduct Planning-Level Reptile and Amphibian Surveys

Conduct a survey, or inventory, of reptile and amphibian species on Rivanna Station. Ensure completion during the breeding season to provide baseline information, including abundance and distribution information. The DoD Partners in Reptile and Amphibian Conservation (PARC) committee can help guide and prioritize inventorying and monitoring. PARC's technical publications, Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians may inform the qualitative and quantitative techniques for obtaining diversity, distribution, and abundance. Use the survey results to create a list of reptile and amphibian species on the installation property. In that species list, articulate the habitat(s) where the species occur. Survey results will inform future INRMP updates, objectives, and associated actions.

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LIST OF ACRONYMS

ACP	Access Control Point
BRAC	Base Realignment and Closure
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
CDC	Child Development Center
CFR	Code of Federal Regulations
CWA	Clean Water Act
DCR-DNH	Department of Conservation and Recreation Division of Natural Heritage
DIA	Defense Intelligence Agency
DoD	Department of Defense
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
DPW	Directorate of Public Works
FEMA	Federal Emergency Management Act
FIRM	Flood Insurance Rate Maps
FPPA	Farmland Protection Policy Act
INRMP	Integrated Natural Resources Management Plan
INSCOM	Intelligence and Security Command
IPaC	Information, Planning, and Conservation System
JUIAF	Joint Use Intelligence Analysis Facility
MBTA	Migratory Bird Treaty Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	Mean Sea Level
MSS	Mission Sensitive Species
NEPA	National Environmental Policy Act
NFRR	North Fork Rivanna River
NGA	National Geospatial-Intelligence Agency
NGIC	National Ground Intelligence Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PARC	Partners in Reptile and Amphibian Conservation
PIF	Partners in Flight
RDF	Remote Delivery Facility
RPMP	Real Property Master Plan
SHPO	State Historic Preservation Office
TOYR	Time-of-Year Restriction
ULC	United Land Corporation
US	United States
USACE	United States Army Corps of Engineers

USFWS	United States Fish and Wildlife Service
USDA	United States Department of Agriculture
USGS	United States Geological Society
VaFWIS	Virginia Fish and Wildlife Information Service
VBS	Virginia Bluebird Society
VCC	Visitor Control Center
VDCR	Virginia Department of Conservation and Recreation
VDGIF	Virginia Department of Game and Inland Fisheries
WL	Watch List
WNS	White-nose Syndrome
WoUS	Water of the United States

Appendix C

Fort Belvoir Policies

DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON, FORT BELVOIR
Fort Belvoir, Virginia 22060-5928

FB Regulation 40-905 **15 February 2000**

Medical Services
Animal Control

FOR THE COMMANDER:

KURT A. WEAVER
COL, AR
Garrison Commander

JOHN S. HODGE
Adjutant General

DISTRIBUTION:
F
5441 (10)
5840 (05)

History. This publication was last printed 24 July 1996. This printing publishes changes since that date.

Summary. This is a revised regulation. It sets forth policies and procedures for the administration of the Veterinary Preventive Medicine Program on Fort Belvoir.

Applicability. This regulation applies to all persons residing on, employed by, serving on, or visiting Fort Belvoir, Virginia.

Suggested Improvements. The proponent of this regulation is the Chief, Fort Belvoir Branch Veterinary Services, National Capital District Veterinary Command. Users are invited to send comments and suggested improvements on DA Form 2028, Recommended Changes to Publications and Blank Forms, to Chief, Fort Belvoir Branch Veterinary Services, Fort Belvoir, 10015 Theote Rd., ATTN: MCVS-ATC-A, Fort Belvoir, VA 22060-5441.

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*This regulation supersedes Fort Belvoir Regulation 40-905, dated 24 July 1996.

1. **PURPOSE AND APPLICABILITY**.

a. Prescribes regulations pertaining to detection, prevention, and control of animal diseases transmissible to humans. Special emphasis is placed on the animal owner's role in animal disease prevention and control.

b. Applies to all persons residing upon, employed by, serving on, or visiting Fort Belvoir, Virginia.

2. **DEFINITIONS.**

a. Pet animal. A privately-owned animal living in association with a household; including dogs, cats, finches and psittacine birds, small rodents, domestic rabbits, amphibians, and non-venomous snakes. (Poisonous reptiles are not authorized as pets.)

b. Feral animal. Pet animals that have become wild and, normally, do not have collars or tags. Feral animals can and do live in housing areas, which is where they can be the most dangerous to persons and pets.

c. Stray animal. Generally, a pet animal running freely, not under supervision, and uncontrolled.

d. Wild animal. Any animal normally considered to be non-domestic, including (but not limited to) skunks, raccoons, and exotic animals. The offspring of domestic animals crossbred with wild animals (i.e. wolf hybrids) are considered wild animals.

e. Unsanitary condition. Defecation and/or urination by a pet animal on government property or in government quarters so as to create an unhealthy or offensive condition.

f. Proper physical control. An animal is considered to be under proper physical control when: (1) on an appropriate leash, chain or cable and (2) under adequate observation and voice control of a physically capable and responsible person.

g. Neglect. Failure to provide proper care for a pet animal. Proper care includes, but is not limited to, adequate protection from weather, adequate food and water, adequate sanitation and adequate human supervision.

h. Abuse. Willful injury or mistreatment of an animal.

i. Post Veterinarian. The officer in charge of the Fort Belvoir Branch of the National Capital District Veterinary Command serves as the Fort Belvoir Post Veterinarian.

3. **REGISTRATION/PROHIBITED PETS/VACCINATIONS.**

a. Owners of dogs and/or cats will report to the Fort Belvoir Veterinary Treatment Facility (VTF), located at 10015 Theote Rd, for registration of their pets within 5 working days of occupying installation quarters or acquiring the animal. Upon seeing proof of current rabies immunization, veterinary personnel will issue a DD Form 2208 or NASPHV Form 50 (Rabies Vaccination Certificate), and a Fort Belvoir rabies tag. If an animal is too young for rabies vaccination, a properly completed medical record may serve as a temporary registration document until such time that the animal is old enough to be vaccinated.

b. The owner will ensure that all pet animals are properly immunized and properly tagged at all times.

c. All persons are prohibited from raising pigeons, chickens, and farm animals on the installation without permission from the Garrison Commander.

d. No one may keep pet animals on Fort Belvoir for commercial purposes.

e. The number of dogs or cats permitted in government quarters is limited to two adults and one litter under three months of age per family. The number of small rodents, rabbits, birds, etc., permitted in government quarters is limited to two adults of each species and one litter under three months of age per family. The Garrison Commander must approve, in writing, any exceptions to this provision.

4. **HOUSING.**

a. Fort Belvoir Housing Office will provide residents with a copy of this regulation when they sign for quarters. Fort Belvoir VTF will maintain additional copies of this regulation for distribution, as needed. Residents failing to comply with this regulation may be subject to termination of quarters.

b. Family housing occupants will ensure that pet animals are maintained in a humane manner, to include the following:

(1) Adequate shelter from heat or cold while kept outside.

(2) Maintenance of a high level of sanitation where animals are housed.

(3) Adequate, accessible quantities of fresh drinking water at all times.

(4) Adequate feed daily.

(5) Arrangements for pets to receive care while the owners are away from home longer than one day.

c. Because of confined living space and human considerations, occupants of unaccompanied personnel quarters may not keep any type of animal in their quarters except tropical fish in a suitable, small aquarium.

d. Animals will not be brought into or maintained within guest housing at Fort Belvoir.

5. **CONTROL OF ANIMALS**.

a. All Fort Belvoir residents or personnel visiting Fort Belvoir who own, or are in possession of pet animals, will maintain the pet animals under proper physical control at all times.

b. Pet owners will ensure that pet animals are controlled to the extent necessary to prevent loud or continuous barking, annoyance, littering, destruction of plants and other property, and/or injury to people and other animals.

c. Pet owners will ensure that female pet animals in heat are closely controlled to preclude problems with other animals. Male and female dogs will be properly restrained and confined to prevent roaming. It is highly recommended that all dogs and cats are neutered or spayed to prevent this problem.

d. Pet owners must immediately clean-up and properly dispose of all fecal waste created by their pet animal in public areas, yard areas of other residents and in their own yard. All feces an animal generates will be disposed of in a trash receptacle within a 24-hour period in order to reduce disease being spread from animals to humans.

e. Pet owners must not allow their pet animals to create an unsightly, offensive, or potentially unhealthy environment with their excrement. Excrement must be picked up and disposed of daily.

f. Pet owners will not leave animals unattended inside motor vehicles.

g. At no time are pet animals permitted on installation picnic grounds, playgrounds, ball fields, or other public areas where people may congregate.

h. Pet animals are permitted in the wildlife refuge areas provided they are kept on a leash and under proper physical control at all times.

i. All personnel are forbidden from abandoning animals on this military reservation. Unwanted animals will be taken to a humane animal shelter.

6. **VIOLATIONS AND COMPLAINTS/STRAYS**.

a. The Provost Marshal Office (PMO) has overall responsibility for animal control enforcement efforts. All complaints concerning animals, animal control, and/or violations of policy established by this regulation should be reported to the Provost Marshal Office, 9650 Theote Road, 806-3104/3105.

(1) The Directorate of Installation Support oversees the base contracted agent, currently DynCorp, which is tasked with picking up stray, injured or dead animals. DynCorp point of contact is the Pest Control Section, 806-3109.

(2) The PMO will be responsible for picking up vicious or uncontrollable animals after duty hours and delivering them to the Fort Belvoir VTF. Point of Contact is the Military Police Desk, 806-3104.

b. PMO personnel may pick up any improperly controlled pet, or any pet which is not kept in accordance with this regulation. Pets that are picked up will be delivered to the Fort Belvoir VTF, 10015 Theote Rd.

c. STRAYS.

(1) PMO or DynCorp personnel will transport captured stray animals to the Fort Belvoir VTF.

(2) Fort Belvoir VTF will attempt to identify the animal and notify the owner. A stray animal will be maintained by the Fort Belvoir VTF for a period of 3 working days. If not claimed by the owner within this time period, the animal becomes government property and is subject to adoption or euthanasia.

(3) Pet owners who reclaim their pets will be charged a fee to cover food and sanitation supplies used for their animal's care, as well as administrative expenses. Pet owners also will be charged for any medications or treatments received by their pet during its stay in the Fort Belvoir VTF.

(4) An animal's first offense as a stray will result in the pet owner being reported in the MP journal. Subsequent offenses will result in the pet owner being reported in the MP blotter.

(5) The Garrison Commander may, at his/her discretion, order any animal removed from this post after three stray incidents.

d. NEGLECT/ABUSE:

(1) PMO personnel may pick up alleged neglect case animals if the owner cannot be contacted. The owner will be cited on the MP blotter report. The animals will be transported to the Fort Belvoir VTF. Veterinary personnel will examine the animal for signs of neglect. The owner will be responsible for all charges incurred, (including transport, board, medical treatment, vaccinations, etc.). The owner may coordinate with Veterinary Services for pick up of the animal.

(2) PMO personnel may pick up alleged abuse case animals for transport to the Fort Belvoir VTF. The owner will be cited on the MP blotter report. Veterinary personnel will examine the animal for signs of abuse. The owner will be responsible for all charges incurred (including transport, board, medical treatment, vaccinations, etc.) and will notify the owner if the animal may be released.

(3) If, after veterinary examination, the condition of the animal, the animal’s environment, or the animal’s care is deemed substandard, Veterinary Services may recommend against returning the animal to the owner. In these instances, Veterinary Services will provide care for the animal until a final decision is made by the Garrison Commander.

7. **ANIMAL BITES.**

a. Emergency Room (ER) personnel will promptly notify the MP Desk Sergeant of all reported animal bites and will prepare DD Form 2341, Report of Animal Bite, for animal bite cases. The DD Form 2341 will be faxed to the Fort Belvoir VTF at 805-3452. The original copy of DD Form 2341 will be forwarded to the Fort Belvoir VTF.

b. The Post Veterinarian will contact the appropriate county health officials to arrange for quarantine and follow-up of off-post animals. The Post Veterinarian will coordinate off-post bite cases between the Rabies Control Board, DeWitt Army Community Hospital, and local authorities. The Post Veterinarian will contact the animal owner to arrange for quarantine and follow-up of on-post animals. The Post Veterinarian may contact the Provost Marshal Office if assistance is needed in locating or apprehending an animal that has been involved in a bite incident on this installation. The Post Veterinarian will coordinate all bite cases between the Rabies Control Board, DeWitt Army Community Hospital, and local authorities when required.

c. Animals known to have bitten or injured a person on this installation will be taken to the Fort Belvoir VTF, 10015 Theote Rd, telephone 805-4459/3351/2368, within one working day of the incident. Pet owners are responsible for transportation of pet animals involved in bite incidents to the Fort Belvoir VTF for pre- and post-quarantine examinations. The Provost Marshal is responsible for the capture and transport of stray or wild animals involved in bite incidents to the Fort Belvoir VTF.

d. For pet animals involved in bite incidents, the Post Veterinarian will determine if the pet owner may quarantine the animal in quarters for the 10-day quarantine period, or if the animal must be impounded at the Fort Belvoir VTF or an approved alternate site. Pet animals may be released from quarantine only during normal operational hours of the Fort Belvoir VTF.

e. Animals belonging to active duty military personnel assigned to Fort Belvoir but residing off-post may be quarantined at the Fort Belvoir VTF on a space available basis.

f. When practical, wild animals should be brought alive to the Fort Belvoir VTF. If it is necessary for the animal to be destroyed in its environment, care should be exercised not to damage the head as it is essential in the diagnosis of rabies.

g. For an animal involved in a second bite incident, if the first incident was a particularly vicious attack or if it is determined to be in the best interest of the Fort Belvoir military community, the Post Veterinarian will recommend to the Installation Commander that the animal be removed from post. The Installation Commander may direct the owner to remove the animal from the installation at the end of the 10-day quarantine period.

h. The Directorate of Installation Support (DIS) will process all letters of removal for the Garrison Commander's signature.

8. **WILDLIFE.**

a. No one can capture or possess wild or exotic animals on Fort Belvoir.

b. Except for the use of bird feeders, all persons are prohibited from feeding any wildlife on the installation without the approval of the Department of Defense (DOD) Game Warden, 806-4007.

c. DIS will oversee Fort Belvoir’s contracted agent, currently DynCorp, for any capture or transport of wild animals to the Fort Belvoir VTF.

d. Wild animals captured by personnel on the installation will be taken to the Post Federal Game Warden, 806-4007.

e. It is illegal in the State of Virginia to capture or possess any wildlife without the proper permits, including fish and reptiles.

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

REPLY TO
ATTENTION OF

IMBV-PWE

26 June 2014

MEMORANDUM FOR US Army Fort Belvoir Personnel

SUBJECT: Fort Belvoir Policy Memorandum #28, Environmental Policy

1. REFERENCE: Army Regulation 200-1 (Environmental Quality, Environmental Protection and Enhancement), 13 December 2007.

2. PURPOSE. To promulgate Fort Belvoir's commitment to environmental management.

3. APPLICABILITY. This policy applies to all military, civilians, mission partners and contractor activities at Fort Belvoir.

4. POLICY. Fort Belvoir is committed to the protection of the environment, within mission and funding constraints, and will be accountable for its decisions. In support of this environmental policy, Fort Belvoir will:

a. Comply with legal and other requirements applicable to the conduct of Fort Belvoir's mission while continually improving Fort Belvoir's environmental performance.

b. Integrate sound pollution prevention practices, waste minimization and sustainable practices into daily decisions, activities and planning.

c. Conserve and protect our natural resources, special natural areas and wetlands through efficient use, reuse and sustainable management.

d. Promote sustainable goals and strategies that address life-cycle and operational costs, planning sustainable sites, safeguarding water resources, improving energy efficiency and performance, conserving materials and resources, and enhancing indoor environmental quality.

e. Proactively manage environmental issues and act promptly and responsibly to correct incidents or conditions that endanger health, safety, or the environment.

f. Assess the environmental impacts of proposed development projects, changes in land use, and other policy or process initiatives designed to enhance the function, mission, or quality of life at Fort Belvoir and communicate them to the surrounding community.

g. Communicate this environmental policy to all persons working for or on behalf of Fort Belvoir, and make available to the public.

h. Ensure conformance of this environmental policy by all members of the Fort Belvoir community in accordance with their roles and responsibilities. To support this commitment, we will continue to document, implement and maintain our Garrison-wide Environmental Management System (EMS) in accordance with ISO 14001:2004 and track our environmental performance. Our EMS provides a framework for setting and reviewing environmental objectives and targets.

5. PROPONENT. The proponent and responsible agency for this policy is the Directorate of Public Works at 703-806-3017.

MICHELLE D. MITCHELL
Colonel, AG
Commanding

DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5930

REPLY TO ATTENTION OF

ANFB-ELE-E (25-30xx) 15 August 2000
USAGFB Policy Memorandum # 420-22-00

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Tree Removal and Protection Policy

(Expires 14 August 2001)

1. Applicability. This policy applies to all military, civilian and tenant activities on Fort Belvoir.

2. Proponent. The proponent and responsible agency of this policy is the Directorate of Installation Support (DIS), Environmental and Natural Resource Division (ELE-E), 806-4007.

3. Policy.

a. In recognition of the value and benefits that trees provide to the Fort Belvoir Community, all proposed tree and shrub removals as well as construction and excavation activities that may impact the growth and survival of trees are to be approved by the DIS. Dogwood, holly, redbud, and mountain laurel are to be left standing on utility rights-of-way unless an exception to this policy is specifically approved in writing by the DIS.

b. It is the policy of Fort Belvoir to promote site planning techniques and construction practices that maximize retention and protection of existing trees before considering removal. When considering open trenching of utility lines, equal design consideration must be given to boring, pipe-bursting, slip-lining and other techniques that result in lower impacts to trees. Utility rights-of-way are to be co-located where warranted except when prohibited by code. Tree protection measures for retained trees will be required for all construction.

c. All contractors and sub-contractors are required to contact the DIS, Environmental and Natural Resource Division for a brief review of natural resource protection requirements before the start of work on Fort Belvoir. This is to be done in conjunction with the excavation permit.

d. Two new trees are to be planted for each tree 4 inches and larger in diameter (diameter breast height) removed through construction on Fort Belvoir. Requirements for size and species

will depend on site characteristics and location. The DIS will make this assessment and recommendation. Replacements will generally follow the scheme that includes nursery grown landscape trees for trees that are removed in improved grounds and high visibility areas, and tree seedlings with a mixture of landscape trees for trees lost in unimproved grounds. The primary contractor/agency for the job will be responsible for purchasing and planting designated trees unless otherwise noted in the statement of work, or as the contracting officer directs. New planting plans must be approved in writing by the DIS prior to the removal of any trees.

4. This policy letter does not supersede any other policy letter.

Kurt A. Weaver

KURT A. WEAVER
COL, AR
Garrison Commander

DISTRIBUTION:
F

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

REPLY TO
ATTENTION OF

IMBV-PW

2 October 2017

MEMORANDUM FOR Fort Belvoir Watercraft Recreation, Hunting, and Fishing Participants

SUBJECT: Fort Belvoir Policy Memorandum #75, Watercraft Recreation, Hunting, and Fishing

1. REFERENCES:

a. Engel Act (10 USC 2671), February 1958

b. Sikes Act (16 USC 670a), September 1960

c. Department of Defense Instruction Number 4715.03 (Natural Resources Conservation Program), February 2011

d. Army Regulation 200-1 (Environmental Protection and Enhancement), December 2007

e. Fort Belvoir Integrated Natural Resources Management Plan (INRMP), August 2017 (Draft)

2. PURPOSE. To implement the Fort Belvoir Watercraft Recreation, Hunting, and Fishing Manual.

3. APPLICABILITY. This policy applies to all persons participating in watercraft recreation, hunting, and fishing on Fort Belvoir.

4. POLICY.

a. Authorization. All watercraft recreation, hunting, and fishing are authorized and controlled by the Garrison Commander in accordance with applicable law, regulation, and policy. Patrons who fail to adhere to these provisions may suffer permanent loss of watercraft recreation, hunting, and fishing privileges on Fort Belvoir and/or criminal prosecution. Recreational opportunities are a privilege, not a right.

b. This policy is implemented in accordance with the Sikes Act, which requires military installations to provide for the sustainable multipurpose use of natural resources, to include hunting, fishing, trapping, and non-consumptive uses. Furthermore, Army Regulation 200-1 requires installations to collect fees for hunting, fishing, and trapping and deposit them into the Army Fish and Wildlife Conservation Fund to be utilized for fish and wildlife habitat projects, management, and conservation.

c. Restrictions on recreational activities are established to ensure safety, security, protection of property and natural resources, and to support the military mission. There are no guarantees

of places for recreational activities, and those areas are subject to closure based upon scheduled military trainings, safety, or natural resources management.

d. The Fort Belvoir Watercraft Recreation, Hunting, and Fishing Manual outlines all guidelines and procedures for authorized users to participate in the activities on Fort Belvoir. The Manual also summarizes Fort Belvoir policies and regulations as they apply to each activity.

e. Supplementation. A Supplement to the Manual is included and details all revisions and summaries of changes. The Supplement is reviewed and updated annually to reflect all watercraft recreation, hunting, and fishing seasons, dates, and permit fees in accordance with United States Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, and Fort Belvoir policies and procedures.

f. The Fort Belvoir Watercraft Recreation, Hunting, and Fishing Manual and Supplement are subject to change at any time. Changes will be posted at Outdoor Recreation (ODR) website (https://belvoir.armymwr.com/programs/outdoor-recreation), iSportsman website (www.ftbelvoir.isportsman.net), Fort Belvoir website (www.belvoir.army.mil), and Fort Belvoir newspaper and social media outlets.

g. Suggested Improvements. Users are invited to send comments/suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms), to Directorate of Public Works, Environmental Division (Kevin Walter), 9430 Jackson Loop, Fort Belvoir, VA, 22060.

5. PROPONENT. The proponent of this policy is the Directorate of Public Works, Environmental Division at 703-806-3193.

Encl
Manual

CHRISTOPHER L. TOMLINSON
LTC, MI
Commanding

Supplement to the Fort Belvoir Watercraft Recreation, Hunting, and Fishing Manual

Prepared By

Environmental Division, Directorate of Public Works

United States Army Garrison Fort Belvoir

September 2017

Table of Contents

Record of Revisions

Page	Chapter	Description	Date
All	All	First Issue	28 September 2017

1. Introduction

a. This Supplement to the Fort Belvoir Watercraft Recreation, Hunting, and Fishing Manual provides a list of activities, associated permit fees, seasons, maps, parking areas, special area restrictions, and a sunrise/sunset table. This Supplement is subject to change if United States Fish and Wildlife Service (USWFS), Virginia Department of Game and Inland Fisheries (VDGIF), and/or Fort Belvoir policies; and procedures change.

b. This Supplement will be reviewed, revised as needed, and re-issued annually to reflect any changes and modifications. A Record of Revisions will be included in this Supplement as well as a Summary of those changes and modifications.

2. Bowhunting

Permits – except for Youth permits, all permits listed are required for patrons 16 years of age and older. The following bowhunting permits are available for purchase for the 2017-2018 hunting season:

Permit	Cost
Deer Scouting – required to scout deer.	**Free**
Bowhunting Youth – required for all patrons under the age of 16 to bowhunt deer, turkey, and other small game species.	**Free**
Bowhunting Active Duty Military – required for Active Duty Military to bowhunt deer, turkey, and other small game species.	**$30**
Bowhunting DoD Civilians/Retired Military – required for DoD Civilians and Retired Military to bowhunt deer, turkey, and other small game species.	**$35**
Bowhunting Non-Affiliated Civilians – required for Non-Affiliated Civilians to bowhunt deer, turkey, and other small game species.	**$40**
Bowhunting 3-Day – required for Active Duty Military, DoD Civilians, Retired Military, and Non- Affiliated Civilians to bowhunt deer, turkey, and other small game species for three consecutive days from day of validation.	**$15**

Seasons – it is the responsibility of each hunter to know and follow the appropriate season and bag limits set by VDGIF.

Season	2017-2018 Dates
Deer Scouting	**August 19 – September 1**
Deer (Youth/Apprentice)	**September 30**
Deer (Early Antlerless)	**September 2 – October 6**
Deer (Either Sex)	**October 7 – January 6**
Deer (Late Antlerless)	**January 7 – March 24**
Fall Turkey	**October 7 – November 10, November 23, December 4 – December 30, January 13 – January 27**
Spring Turkey (Youth/Apprentice)	**April 7**
Spring Turkey	**April 14 – May 19**
Other wildlife	**IAW VDGIF regulations and seasons**

Map – See Appendix A.

3. Waterfowl

Permits – except for Youth permits, all permits listed are required for patrons 16 years of age and older. The following waterfowl hunting permits are available for purchase for the 2017-2018 hunting season:

Permit	Cost
Waterfowl Youth – required for all patrons under the age of 16 to hunt waterfowl.	**Free**
Waterfowl Active Duty Military – required for all Active Duty Military to hunt waterfowl.	**$75**
Waterfowl DoD Civilian/Retired Military – required for all DoD Civilians and Retired Military to hunt waterfowl.	**$100**
Waterfowl Non-Affiliated Civilian – required for all Non-Affiliated Civilians to hunt waterfowl.	**$125**
Waterfowl 3-Day – required for all patrons to hunt waterfowl for three consecutive days from day of validation.	**$30**
Waterfowl 1-Day – required for all patrons to hunt waterfowl for one day.	**$10**

Seasons – It is the responsibility of each hunter to know and follow the appropriate season and bag limits set by VDGIF and USFWS.

Seasons	2017-2018 Dates
Canada Goose (September)	**September 1 – September 25**
Canada Goose (SJBP)	**November 15 – November 26, December 18 – January 14, January 15 – February 15**
September Teal	**September 16 – September 30**
Youth Waterfowl	**October 21, February 3**
Duck	**October 6 – October 9, November 15 – November 26, December 16 – January 28**
Tundra Swan	**CLOSED – see Tundra Swan ID on website**

4. Fishing

Permits – except for Youth permits, all permits listed are required for those 16 years of age and older. The following fishing permits for the 2017-2018 season are available for purchase and are valid for one year from the date of purchase, except for one and three day permits:

Permits	Cost
Fishing Youth – required for all patrons under the age of 16 to fish.	**Free**
Fishing Active Duty Military – required for all Active Duty Military to fish.	**$5**
Fishing Annual – required for all DoD Civilians, Retired Military, and Non-Affiliated Civilians to fish.	**$10**
Fishing 1-Day – required for all customers to fish for one day on day of validation.	**$1**
Fishing 3-Day – required for all customers to fish for three consecutive days from day of validation.	**$5**

Seasons – It is the responsibility of each angler to know and follow the appropriate season and bag limits set by VDGIF.

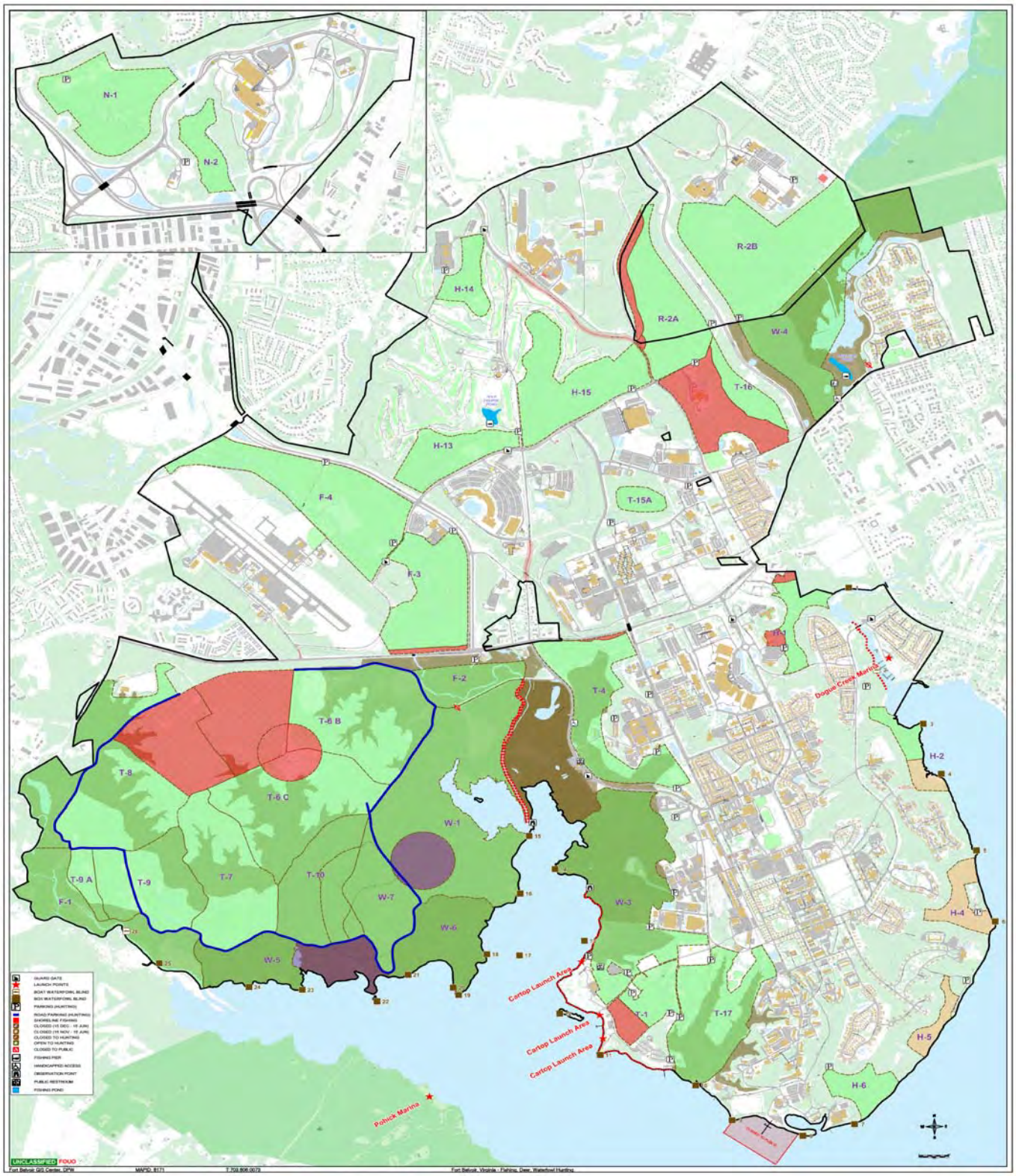
5. Watercraft Launching

Permits – The following permits for 2017-2018 are required to launch watercraft at Fort Belvoir and are valid for one year from the date of purchase, except for the 1 – Day Permit:

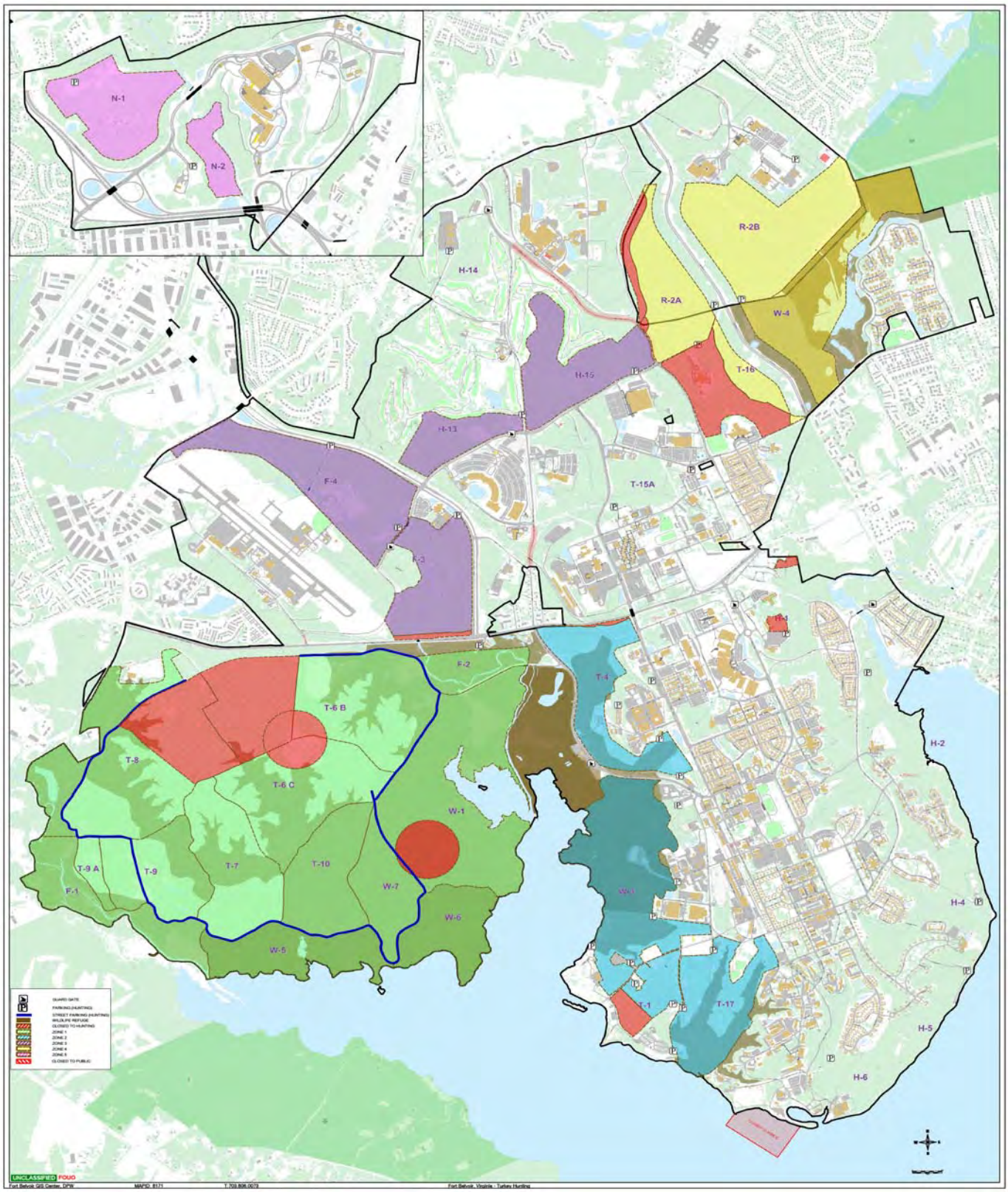
Permits	Cost
Watercraft Launching Annual – required for all patrons to launch non-motorized watercraft	**$10**
Watercraft Launching 1 – Day – required for all patrons to launch non-motorized watercraft for one day on day of validation.	**$1**

Seasons – Fort Belvoir does not have specific Watercraft Launching Seasons.

A. Bowhunting, Waterfowl Hunting, Fishing, Watercraft Launch Sites Map 2017-2018



B. Turkey Hunting Map 2017-2018



Appendix C. Bowhunting Parking Areas 2017-2018

Area	#	Location	GPS Coordinates	
F1, F2, T6B, T6C, T7, T8, T9, T9A, T10, W1, W5, W6, W7		Along Poe Road		
F2	1	Fairfax County Water Station, south of the intersection of RT 1/Fairfax County Parkway	N 38° 42'27.4"	W 077° 09'47.2"
F3	1	Southeast corner of Mosby Reserve Center, outside of fence along FFX CO Pkwy south	N 38° 43'00.1"	W 077° 09'55.0"
	2	West of Farrar Road bridge	N 38° 42'54.2"	W 077° 10'13.9"
F4	1	Ehlers Road, park on right before gate, do not block entrance.	N 38° 43'15.2"	W 077° 10'34.2"
	2	West of Farrar Road bridge	N 38° 42'54.2"	W 077° 10'13.9"
H1		Northeast corner of Community Club parking lot	N 38° 42'28.4"	W 077° 08'18.5"
H2		Gated dirt road east of Mount Vernon Road, drive through gate and lock upon entry/exit	N 38° 42'18.8"	W 077° 07' 55.4"
H4		Sewage station at end of Jadwin Loop, drive through gate and lock upon entry and exit	N 38° 41'19.1"	W 077° 07'23.3"
H5		End of Patrick Road, do not block entry to residences	N 38° 41'02.4"	W 077° 07'25.9"
H6		Directions: From 23rd Street turn onto Putnam Rd, turn left behind Bldg 320, follow dirt road to right of electric substation, then follow dirt road behind Visiting Officers Quarters. Proceed to end of road, parking is on the right.	N 38° 40'42.3"	W 077° 08'05.5"
H13		West of Beulah Rd, before golf course	N 38° 43'25.2"	W 077° 09'36.0"
H14		Southwest corner of golf course maintenance area	N 38° 44'07.0"	W 077° 09'56.8"
H15	1	West of Beulah Rd, before golf course	N 38° 43'25.2"	W 077° 09'36.0"
	2	North of Kingman Rd between Gunston and Woodlawn Roads	N 38° 43'35.9"	W 077° 09'03.6"
N1		.15 miles from the entrance gate along Rolling Rd.	N 38° 45'16.6"	W 077° 12'43.0"
N2		Turn onto Heller Rd, travel .12 miles, parking is straight ahead in front of jersey barrier	N 38° 44'54.9"	W 077° 12'08.3"
R2A	1	North of Kingman Rd gate on left.	N 38° 43'41.8"	W 077° 08'45.1"
	2	End of Kingman Rd, on right or left, before overpass, do not block Kingman Rd.	N 38° 43'51.4"	W 077° 08'37.1"
R2B	1	Drive through Humphreys Engineering Center via Leaf Rd, stop at security gate and provide identification and parking/hunting pass, turn left after proceeding through security fence, parking area is a gravel lot across from soccer field on right. Parking is not permitted at electric substation or end of road.	N 38° 44'29.8"	W 077° 08'14.6"
	2	Drive on Kingman Rd, pass under Jeff Todd Way, proceed .05 miles, parking on left to the north of Kingman Rd.	N 38° 43'52.8"	W 77° 08'30.8"
T1	1	South of Warren Road	N 38° 41'00.9"	W 077° 09'05.4"

	2	West of Morrow Road	N 38° 40'57.1"	W 077° 08'52.2"
T4	1	Behind Recycling Bldg 1089- lock gate upon entry/exit.	N 38° 41'53.6"	W 077° 08'52.1"
	2	Northwest corner of Bldg 1484	N 38° 42'10.7"	W 077° 09'09.2"
	3	Behind Bldg 1422	N 38° 42'02.7"	W 077° 08'56.5"
	4	Drive north on Gunston Rd, turn left onto Jackson Loop, make immediate right onto old railroad bed. Drive approximately .15 miles, parking is on right.	N 38° 42'18.7"	W 077° 09'02.1"
T15A	1	Northwest corner of parking lot behind swimming pool along Wright Rd	N 38° 43'09.1"	W 077° 08'49.2"
	2	Behind MP Station	N 38° 43'00.7"	W 077° 09'08.7"
T16	1	North of Kingman Rd gate on left	N 38° 43'41.8"	W 077° 08'45.1"
	2	End of Kingman Rd, on right or left, before overpass. Do not block Kingman Rd.	N 38° 43'51.4"	W 077° 08'37.1"
T17	1	Fishing pier parking area	N 38° 40'41.1"	W 077° 08'54.9"
	2	Beginning of maintenance road running north/south from Vet Clinic to Morrow Rd	N 38° 40'52.9"	W 077° 08'51.1"
	3	End of maintenance road running north/south from Vet Clinic to Morrow Rd	N 38° 41'07.0"	W 077° 08'42.0"
W3	1	Archery range and Basin Trailhead parking lot	N 38° 41'10.0"	W 077° 09'16.2"
	2	Southwest corner of parking lot behind Bldg 767, do not block gate, park to the side of entrance.	N 38° 41'16.9"	W 077° 09'00.3"
	3	16th St/Pratt Rd gate- DO NOT BLOCK GATE	N 38° 41'25.8"	W 077° 08'51.3"
	4	West corner of parking lot, south of Bldg 1132	N 38° 41'45.0"	W 077° 08'51.4"
	5	Top of Warren Rd- Entrance to "Johnson Controls" fenced compound	N 38° 41'04.5"	W 077° 09'05.0"
W4	1	End of Kingman Rd, on right or left, before overpass. Do not block Kingman Rd.	N 38° 43'51.4"	W 077° 08'37.1"
	2	Drive through Humphreys Engineering Center via Leaf Rd, stop at security gate and provide identification and parking/hunting pass, turn left after proceeding through security fence, parking area is a gravel lot across from soccer field on right. Parking is not permitted at electric substation or end of road.	N 38° 44'29.8"	W 077° 08'14.6"
	3	Drive on Kingman Rd, pass under Jeff Todd Way, proceed .05 miles, parking on left to the north of Kingman Rd.	N 38° 43'52.8"	W 77° 08'30.8"

Appendix D. Bowhunting Special Area Restrictions 2017-2018

Area	Restriction
F-2	This is the flood plain area between Pohick and Poe Roads. The boundaries are north of Poe Road, south of Route 1, and east of Accotink Creek. The Fairfax County homeless shelter is off limits. Only elevated stand hunting is permitted.
F-3/F-4	Bordered by Telegraph Road to the north, Fairfax County Parkway to the east, and the Davison Army Airfield to the south and west. Only elevated stand hunting is permitted.
H-1	Located north and east of the Community Center parking lot and bordered to the south by Surveyor Road and on the north by the Fort Belvoir property line. Only elevated stand hunting is permitted.
H-2	Bordered by Dogue Creek tidal flats to the east and the dirt road to the southwest. Deer removal is permitted from the parking area only. A key is required for this area and the gate is to be opened and closed immediately upon entry and exit. The gate must be locked at all times. The southern half of H-2, marked by red flagging along the drainage ditch behind Markham School, will be closed from November 15, 2017 through the remainder of the hunting season. Only elevated stand hunting is permitted.
H-4	Located between the sewage lift station below Jadwin Loop and the Officer's Club. A key is required for this area and the gate is to be opened and closed immediately upon entry and exit. The gate must be locked at all times. The area will be closed from November 15, 2017 through the remainder of the hunting season. Only elevated stand hunting is permitted.
H-5	Bordered by the Potomac River to the east and Belvoir Village Housing to the west. Bordered by Patrick Road to the north and Fairfax Ruins to the south. Only elevated stand hunting is permitted.
H-6	Bordered by CRML Compound fence to the south and by Fairfax Village Housing and a dirt road leading into the pump station at Fairfax Ruins to the north. Bordered by the Potomac River to the east and to the west by the old perimeter fence road at the R&D Center. Only elevated stand hunting is permitted.
H-13	Bordered clockwise from the north by the National Museum of the US Army, North Post Golf Course, Beulah Road, and J.J. Kingman Road. Only elevated stand hunting is permitted.
H-14	Bordered on the south and east by the North Post Golf Course and on the north and west by the golf maintenance compound and access roads. Only elevated stand hunting is permitted.
H-15	Bordered by Woodlawn Road, J.J. Kingman Road, Beulah Road, and the golf course. Only elevated stand hunting is permitted.
N-1	Located at the Belvoir North Area. Bordered to the east by Accotink Creek, Barta Road to the south, Fairfax County Parkway/Rolling Road to the west, and by a private residential area to the north. Access is through a gate located in the northwest corner of the area along Rolling Road. A key is required for this area and the gate is to be opened and closed immediately upon entry and exit. The gate must be locked at all times. The parking area is located .15 miles from the gate.
N-2	Located at the Belvoir North Area. Bordered to the east by Accotink Creek, Barta Road to the north, Heller Road to the west, and Fairfax County Parkway to the south. Parking area is located .12 miles straight ahead in front of jersey barrier.

T-1	Deer removal is permitted from parking area only. No hunting within fenced area along Johnson and Warren Roads. No hunting from eastern fence boundary to stream drainage marked by red flagging. Only elevated stand hunting is permitted.
T-4	Located between Pohick and Gunston Roads, and bordered to the north by Route 1, and to the south by the recycling building 1089. Only elevated stand hunting is permitted.
T-6B	No hunting west of paved road running south from Poe Road to fenced compound. No hunting within 250 yards of the fenced compound between T-6B and T-6C. The boundary is marked with red flagging. The restriction on entering the closed area will be strictly enforced. Hunters are prohibited from entering the area to until DES is notified (703) 806-3104 and a CLEO is present.
T-6C	No hunting within 250 yards of the fenced compound between areas T-6B and T-6C. The boundary is marked with red flagging. The restriction on entering the closed area will be strictly enforced. Hunters are prohibited from entering the area until DES is notified (703) 806-3104 and a CLEO is present.
T-8	No hunting in area within eastern boundary of T-8, north to Poe Road, south to T-7 and T-6C, and to the west marked by signs which read “Danger- Unexploded Ordnance- Do Not Enter”. The restriction on entering the closed area will be strictly enforced. Hunters are prohibited from entering the area until DES is notified (703) 806-3104 and a CLEO is present.
T-15A	Bordered to the north by Gorgas Road, to the south by Abbott Road, and to the west by Gunston Road. Only elevated stand hunting is permitted.
T-16	Located east of the intersection of Woodlawn and J.J. Kingman Roads. Bordered by Meeres Road to the south, Jeff Todd Way to the east, and R-2A to the north. The no hunting area is delineated by natural drainages and is marked by red flagging. Hunters are prohibited from entering the flagged area until DES is notified (703) 806-3104 and a CLEO is present.
T-17	Bordered to the west by Morrow Road, to the north by the ball fields, to the east by the R&D Center perimeter fence, and to the south by the Gunston Cove shoreline. Only elevated stand hunting is permitted.
W-1	The bald eagle management area is located in the southwest corner of W-1 and marked with red flagging and will be closed December 15, 2017 through the remainder of the season. The restriction on entering the bald eagle management area will be strictly enforced. Hunters are prohibited from entering the closed area until DES is notified (703) 806-3104 and a CLEO is present. Only elevated stand hunting is permitted.
W-3	The boundaries are located south of Pohick Road, southeast of the road that divides W-2 and W-3, north of Warren Road, east of Accotink Creek, and west of Tracy Loop. Game is only to be removed from the parking areas. Only elevated stand hunting is permitted.
W-4	Bordered by J.J. Kingman Road to the north, Jeff Todd Way to the west, and Dogue Creek on the east. Access is through Humphrey’s Engineering Center (HEC) or driving under Jeff Todd Way via Kingman Road to parking area. If using HEC access, upon harvesting a deer, hunters are permitted to drive from parking area to pole gate to load deer. No parking or deer removal from Woodlawn Village.
W-5	The bald eagle management area extends from the eastern boundary of W-5 to the unnamed stream running north/south though the middle of W-5, marked with red flagging, and will be closed from December 15, 2017 through the remainder of the season. The restriction on entering the bald eagle management area will be strictly

	enforced. Hunters are prohibited from entering the closed area until DES is notified (703) 806-3104 and a CLEO is present.
R-2A	Bordered to east by Jeff Todd Way and T-16 to the south. The western boundary is marked by red flagging. Hunters are prohibited from entering the flagged area until DES is notified (703) 806-3104 and a CLEO is present.
R-2B	Located south of HEC, bordered by Jeff Todd Way to the west, and to the east and south by W-4. Access is through HEC or driving under Jeff Todd Way via Kingman Road to parking area. If using HEC access, upon harvesting deer, hunters are permitted to drive from parking area to pole gate to load deer.

Appendix E. Waterfowl Zone Schedule 2017-2018

Week Of	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27 Aug-2 Sept	*	*	*	*	*	ALL	ALL
3-9 Sept	ALL	ALL	ALL	ALL	ALL	ALL	ALL
10-16 Sept	ALL	ALL	ALL	ALL	ALL	ALL	ALL
17-23 Sept	2	3	*	1	*	2	ALL
24-30 Sept	3	1	*	2	*	3	ALL
1-7 Oct	*	*	*	*	*	2	ALL
8-14 Oct	3	ALL	*	*	*	*	*
15-21 Oct	*	*	*	*	*	*	YOUTH-ALL
12-18 Nov	*	*	*	1	*	3	ALL
19-25 Nov	2	1	*	3	TBD	2	ALL
26 Nov-2 Dec	1	*	*	*	*	*	*
10-16 Dec	*	*	*	*	*	*	ALL
17-23 Dec	3	2	*	1	*	3	ALL
24-30 Dec	2	TBD	*	1	*	2	ALL
31 Dec-6 Jan	3	ALL	*	2	*	ALL	ALL
7-13 Jan	Closed	1	3	2	*	3	ALL
14-20 Jan	2	1	*	3	*	2	ALL
21-27 Jan	1	ALL	*	2	*	3	ALL
28 Jan-3 Feb	2	1	*	3	*	2	YOUTH-ALL
4-10 Feb	3	1	*	3	*	2	ALL
11-17 Feb	1	3	*	2	*	1	ALL

Zone 1: Blinds 1-9 – Dogue Creek and Gunston Cove Shorelines

Zone 2: Blinds 10-18 – Gunston Cove and Accotink Bay Shorelines

Zone 3: Blinds 19 – 26 – Pohick Creek and Pohick Bay Shorelines

Notes:

Any blank fields (*) are closed to waterfowl hunting.

Zone 1 – Blinds 4 & 6 will be closed November 15 for the remainder of the season.

Zone 2 – Blind 7 will only be open on Saturdays, Sundays, and Holidays.

Appendix F. Sunrise/Sunset Tables 2017-2018

GENERAL INFORMATION
SUNSET/SUNRISE TIMETABLE

Sunrise and Sunset Timetable – Richmond, Virginia

Times below are Eastern Standard Time and reflect Daylight Saving Time when in use.

	JULY 2017		AUG. 2017		SEPT. 2017		OCT. 2017		NOV. 2017		DEC. 2017		JAN. 2018		FEB. 2018		MAR. 2018		APR. 2018		MAY 2018		JUNE 2018	
DAY	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)	RISE (AM)	SET (PM)
1	5:53	8:35	6:14	8:18	6:40	7:38	7:06	6:53	7:35	6:11	7:06	4:52	7:25	5:02	7:13	5:34	6:41	6:04	6:55	7:33	6:15	8:00	5:50	8:25
2	5:53	8:35	6:15	8:17	6:41	7:37	7:06	6:51	7:36	6:10	7:07	4:52	7:25	5:03	7:12	5:35	6:40	6:05	6:54	7:34	6:13	8:01	5:50	8:26
3	5:53	8:35	6:16	8:16	6:42	7:35	7:07	6:50	7:37	6:09	7:08	4:52	7:25	5:04	7:12	5:36	6:38	6:06	6:52	7:34	6:12	8:02	5:50	8:27
4	5:54	8:35	6:17	8:15	6:43	7:34	7:08	6:48	7:38	6:08	7:09	4:51	7:25	5:05	7:11	5:37	6:37	6:07	6:51	7:35	6:11	8:03	5:49	8:27
5	5:55	8:34	6:17	8:14	6:44	7:32	7:09	6:47	6:39	5:07	7:10	4:51	7:25	5:06	7:10	5:38	6:36	6:08	6:49	7:36	6:10	8:03	5:49	8:28
6	5:55	8:34	6:18	8:12	6:45	7:31	7:10	6:45	6:40	5:06	7:11	4:51	7:25	5:07	7:09	5:39	6:34	6:09	6:48	7:37	6:09	8:04	5:49	8:28
7	5:56	8:34	6:19	8:11	6:45	7:29	7:11	6:44	6:41	5:05	7:11	4:51	7:25	5:08	7:08	5:41	6:33	6:10	6:46	7:38	6:08	8:05	5:49	8:29
8	5:56	8:33	6:20	8:10	6:46	7:28	7:12	6:42	6:42	5:04	7:12	4:51	7:25	5:09	7:07	5:42	6:31	6:10	6:45	7:39	6:07	8:06	5:48	8:30
9	5:57	8:33	6:21	8:09	6:47	7:26	7:13	6:41	6:43	5:04	7:13	4:52	7:25	5:10	7:06	5:43	6:30	6:11	6:44	7:40	6:06	8:07	5:48	8:30
10	5:57	8:33	6:22	8:08	6:48	7:25	7:14	6:39	6:45	5:03	7:14	4:52	7:25	5:10	7:05	5:44	6:28	6:12	6:42	7:41	6:05	8:08	5:48	8:31
11	5:58	8:32	6:23	8:07	6:49	7:23	7:15	6:38	6:46	5:02	7:15	4:52	7:24	5:11	7:04	5:45	7:27	7:13	6:41	7:42	6:04	8:09	5:48	8:31
12	5:59	8:32	6:23	8:06	6:50	7:22	7:15	6:36	6:47	5:01	7:15	4:52	7:24	5:12	7:03	5:46	7:25	7:14	6:39	7:43	6:03	8:10	5:48	8:32
13	5:59	8:32	6:24	8:04	6:50	7:20	7:16	6:35	6:48	5:00	7:16	4:52	7:24	5:13	7:01	5:47	7:24	7:15	6:38	7:43	6:02	8:11	5:48	8:32
14	6:00	8:31	6:25	8:03	6:51	7:19	7:17	6:34	6:49	5:00	7:17	4:53	7:24	5:14	7:00	5:48	7:22	7:16	6:36	7:44	6:01	8:11	5:48	8:32
15	6:01	8:31	6:26	8:02	6:52	7:17	7:18	6:32	6:50	4:59	7:17	4:53	7:23	5:15	6:59	5:49	7:21	7:17	6:35	7:45	6:01	8:12	5:48	8:33
16	6:02	8:30	6:27	8:01	6:53	7:16	7:19	6:31	6:51	4:58	7:18	4:53	7:23	5:17	6:58	5:50	7:19	7:18	6:34	7:46	6:00	8:13	5:48	8:33
17	6:02	8:29	6:28	7:59	6:54	7:14	7:20	6:30	6:52	4:58	7:19	4:54	7:23	5:18	6:57	5:51	7:18	7:19	6:32	7:47	5:59	8:14	5:48	8:33
18	6:03	8:29	6:29	7:58	6:55	7:13	7:21	6:28	6:53	4:57	7:19	4:54	7:22	5:19	6:56	5:52	7:16	7:20	6:31	7:48	5:58	8:15	5:48	8:34
19	6:04	8:28	6:29	7:57	6:55	7:11	7:22	6:27	6:54	4:56	7:20	4:54	7:22	5:20	6:54	5:53	7:15	7:21	6:30	7:49	5:57	8:16	5:49	8:34
20	6:04	8:28	6:30	7:55	6:56	7:09	7:23	6:26	6:55	4:56	7:20	4:55	7:21	5:21	6:53	5:55	7:13	7:22	6:28	7:50	5:57	8:16	5:49	8:34
21	6:05	8:27	6:31	7:54	6:57	7:08	7:24	6:24	6:56	4:55	7:21	4:55	7:21	5:22	6:52	5:56	7:12	7:23	6:27	7:51	5:56	8:17	5:49	8:34
22	6:06	8:26	6:32	7:53	6:58	7:06	7:25	6:23	6:57	4:55	7:21	4:56	7:20	5:23	6:51	5:57	7:10	7:24	6:26	7:52	5:55	8:18	5:49	8:35
23	6:07	8:25	6:33	7:51	6:59	7:05	7:26	6:22	6:58	4:54	7:22	4:56	7:20	5:24	6:49	5:58	7:09	7:24	6:24	7:53	5:55	8:19	5:49	8:35
24	6:08	8:25	6:34	7:50	7:00	7:03	7:27	6:21	6:59	4:54	7:22	4:57	7:19	5:25	6:48	5:59	7:07	7:25	6:23	7:53	5:54	8:20	5:50	8:35
25	6:08	8:24	6:34	7:49	7:00	7:02	7:28	6:19	7:00	4:53	7:23	4:58	7:19	5:26	6:47	6:00	7:06	7:26	6:22	7:54	5:54	8:20	5:50	8:35
26	6:09	8:23	6:35	7:47	7:01	7:00	7:29	6:18	7:01	4:53	7:23	4:58	7:18	5:27	6:45	6:01	7:04	7:27	6:21	7:55	5:53	8:21	5:50	8:35
27	6:10	8:22	6:36	7:46	7:02	6:59	7:30	6:17	7:02	4:53	7:23	4:59	7:17	5:28	6:44	6:02	7:03	7:28	6:19	7:56	5:52	8:22	5:51	8:35
28	6:11	8:21	6:37	7:44	7:03	6:57	7:31	6:16	7:03	4:52	7:24	5:00	7:16	5:30	6:43	6:03	7:01	7:29	6:18	7:57	5:52	8:23	5:51	8:35
29	6:12	8:20	6:38	7:43	7:04	6:56	7:32	6:15	7:04	4:52	7:24	5:00	7:16	5:31			7:00	7:30	6:17	7:58	5:52	8:23	5:52	8:35
30	6:12	8:20	6:39	7:41	7:05	6:54	7:33	6:13	7:05	4:52	7:24	5:01	7:15	5:32			6:58	7:31	6:16	7:59	5:51	8:24	5:52	8:35
31	6:13	8:19	6:40	7:40			7:34	6:12			7:24	5:02	7:14	5:33			6:57	7:32			5:51	8:25		

Apply corrections below to Richmond sunrise-sunset times to obtain official times at other Virginia locations.

LOCATION	CORRECTION
Bristol	+19 minutes
Cape Charles	-6 minutes
Charlottesville	+4 minutes
Chincoteague	-8 minutes
Danville	+8 minutes
Fredericksburg	0 minutes

LOCATION	CORRECTION
Newport News	-5 minutes
Norfolk	-5 minutes
Roanoke	+10 minutes
Tazewell	+16 minutes
Williamsburg	-3 minutes
Winchester	+3 minutes

Information obtained from:

Astronomical Applications Dept.
Location: W077 28, N37 32
U. S. Naval Observatory
Washington, DC 20392-5420
Eastern Standard Time

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

IMBV-PW

MEMORANDUM FOR U.S. Army Fort Belvoir Personnel

SUBJECT: Fort Belvoir Policy Memorandum #___, Conservation of Migratory Birds

1. References:

a. Migratory Bird Treaty Act, of 1918, as amended (16 U.S.C. 703-711).

b. Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, 2001 (66 FR 3853 [January 10, 2001]).

c. The Migratory Bird Treaty Act Does Not Prohibit Incidental Take, U.S. Department of the Interior, Solicitors Opinion M-37050. 22 December 2017.

d. Incidental Take of Migratory Birds Memorandum, Office of the Assistant Secretary of Defense. 6 February 2018.

2. Purpose: Provide mission guidance to avoid or minimize impacts to migratory birds.

3. Applicability: This policy applies to all military, civilian, tenants, and residents on Fort Belvoir.

4. Policy:

a. Fort Belvoir's natural resources are a major asset to the Installation. Migratory birds in particular are an important part of these resources. In accordance with the references listed above Fort Belvoir will conserve migratory bird populations as long as it does not impact the military mission. It is Fort Belvoir's policy to:

(1) Coordinate all proposed tree removals, chimney work, demolitions, repairs and semi-improved grounds mowing that may impact migratory birds during the nesting season as described in sections a-h below.

(2) Promote site planning best management practices to avoid or minimize impacts to migratory birds. Coordinate early in the planning/design phase with the Directorate of Public Works Environmental Division (DPW Env Div) to review project objectives, design features, natural resource impacts, mitigations, and compliance with the above-cited migratory bird laws and policies.

(3) Follow time of year (TOY) avoidance for nesting migratory birds as developed in cooperation with the U.S. Fish and Wildlife Service (USFWS), using species-specific egg date records for birds nesting in Virginia.

(a) Tree cutting/clearing activities – Avoid these activities 1 April - 15 July.

(b) Tree or shrub pruning – If a bird nest is found in a shrub or on a tree branch, the nest or branches associated with the nest should not be disturbed if the nest is active.

(c) Semi-improved mowing – Avoid mowing at the airfield, closed landfills, and native meadows from 25 April - 31 July.

(d) Chimney maintenance, repair or removal – Chimney swifts nest in chimneys. Avoid performing chimney maintenance, repair or removal from 5 May - 28 July.

(e) Ground nesting birds – Killdeer build nests in parking lots, gravel lots, roof tops or fields. If a nest is found, place a five-foot buffer around the nest with orange cones and/or flagging, and coordinate with DPW Env Div. Killdeer nesting dates are 6 March - 27 June.

(f) Osprey Nest Removal – Avoid nest removals from 16 April - 15 September. If a nest must be removed during that time, written consent must be obtained by Virginia Department of Game and Inland Fisheries and a permit from USFWS.

(g) Bald Eagle Protection – Bald eagles nest from 15 November - 15 June. Eagle nests are also protected during the non-nesting season. All activities within bald eagle nest territories (within 750 feet of the nest) must be coordinated with DPW Env Div.

(h) Active Bird Nest Removal - For any activity, including demolition and repair, any time of the year where an active bird nest is encountered, or where an active bird nest requires removal, contact DPW-ED as a USFWS permit may be required.

b. All of the above avoidance criteria shall be adhered to unless approved by DPW Env Div. For osprey and eagle nest issues contact DPW Env Div as a USFWS permit may be required.

5. Proponent: Directorate of Public Works, Environmental Division at 703-806-0049.

CHRISTOPHER L. TOMLINSON
LTC, MI
Commanding

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

REPLY TO
ATTENTION OF

IMBV-PW

12 August 2016

MEMORANDUM FOR US Army Fort Belvoir Personnel

SUBJECT: Fort Belvoir Policy Memorandum #32, Integrated Pest Management

1. REFERENCES:

a. Fort Belvoir Integrated Pest Management (IPM) Plan, December 2015

b. Army Regulation 200-1 (Environmental Protection and Enhancement), 13 December 2007

c. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended

d. DoD Instruction 4150.7, DoD Pest Management Program, 29 May 2008

2. PURPOSE. To ensure compliance with all laws and regulations that apply to the application and storage of pesticides on Fort Belvoir.

3. APPLICABILITY. This policy applies to all organizations, partners and contractors performing pest management operations on Fort Belvoir.

4. POLICY.

a. All pest management operations on Fort Belvoir must be in compliance with the current Fort Belvoir Integrated Pest Management (IPM) Plan as well as applicable laws, regulations, and Interservice/Intraservice Support Agreements (ISAs) between Fort Belvoir and partner organizations that specify respective responsibilities regarding pesticide applications, records and contracts. All partner organizations on Fort Belvoir must contact the Directorate of Public Works (DPW) for pest management contract support, review and compliance assistance in accordance with their ISAs with Fort Belvoir.

b. Integrated pest management is a planned decision-making process that incorporates education, record keeping and best management practices (cultural, biological and habitat modification) to prevent pests and diseases from causing damage to personnel and property. The IPM objective is to identify operational procedures that use the least toxic method to control pest populations in a cost-effective, environmentally sound method.

c. All organizations, partners, contractors and sub-contractors planning to engage in pest management operations on Fort Belvoir must submit the following documentation to DPW, Pest Management Coordinator (FB-PMC) not less than 10 workdays prior to the application of pesticides for each target pest:

(1) A completed Fort Belvoir IPM Evaluation and Execution Form, FB(DPW) FM 76, dated 30 June 2004.

(2) Copies of labels for all pesticides to be applied on Fort Belvoir.

(3) Current Pesticide Applicator Certifications.

d. All monthly pesticide applications must be recorded on DD Form 1532, Pest Management Record, or other satisfactory format and submitted to the FB-PMC.

5. PROPONENT. The proponent and responsible agency for this policy is the Directorate of Public Works, Environmental and Natural Resources Division at 703-806-4007.

ANGIE K. HOLBROOK
Colonel, AG
Commanding

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

REPLY TO
ATTENTION OF

IMBV-PW

12 August 2016

MEMORANDUM FOR US Army Fort Belvoir Personnel

SUBJECT: Fort Belvoir Policy Memorandum #27, Tree Removal and Protection

1. References.

a. American Association of Nurseryman, American Standard for Nursery Stock (ANSI Z60.1), current edition.

b. Fort Belvoir Integrated Natural Resource Management Plan Appendix L, Section 1.7: Protection of Retained Trees.

2. Purpose. To ensure protection and preservation of specimen trees on Fort Belvoir.

3. Applicability. This policy applies to all military, civilian, and partner activities on Fort Belvoir.

4. Policy.

a. Fort Belvoir's urban forest and associated natural resources are a major asset to the installation and its residents. In recognition of the value and benefits that trees provide to the Fort Belvoir Community, all proposed tree removals, as well as construction and excavation activities that may impact the growth and survival of trees, require prior review and written approval by the Fort Belvoir Director of Public Works.

b. It is the policy of Fort Belvoir to promote site planning techniques and construction practices that maximize retention and protection of trees before considering removal. Site reviews regarding natural resource impacts shall be made early in the planning and design process. When considering open trenching of utility lines, consideration must be given to boring, pipe-bursting, slip-lining and other techniques that lower impacts to trees. Utility rights-of-way shall be co-located except when prohibited by code. Tree protection measures for retained trees shall be required for all construction. Project leaders, master planners, and designers shall meet with DPW Environmental and Natural Resources Division (ENRD) to review project objectives, design features, natural resource impacts and mitigations, and compliance with applicable environmental laws and regulations.

c. Construction projects shall include a DPW approved landscape plan. The construction design and landscape plan shall include mitigation for tree loss and identification of all trees four inches and larger in diameter at breast height that may be impacted by the construction project, to include specimen trees that should be preserved as well as tree replacements and new plantings.

d. Two new trees shall be planted for each live tree four inches in diameter and larger removed through construction, unless the project in question is expressly exempted from this replacement requirement. The rationale behind this 2:1 replacement ratio is that trees planted in urban forest situations only survive for an average of seven years and trees being replaced are generally far larger than trees planted as in-kind, compensatory mitigation. Requirements for size and species will depend upon site characteristics and location. DPW-ENRD will make this assessment. Tree replacements will generally adhere to a prescribed scheme that includes nursery-grown landscape trees for those removed in improved grounds and high visibility areas, and native tree seedlings with a mixture of landscape trees in unimproved grounds. If it is not possible to plant the required number of replacement trees, project-related alternatives such as environmentally-beneficial restoration, enhancement, or preservation measures may be done. DPW approval of out-of-kind, compensatory mitigations is required and funding must be equivalent to that required to plant the remaining trees. DPW-ENRD maintains a list of mitigation options and restoration sites.

e. All trees to be planted shall meet the specifications of American Association of Nurseryman, American Standard for Nursery Stock (ANSI Z60.1) latest edition. Plantings shall be prepared in accordance with the Fort Belvoir Integrated Natural Resource Management Plan Appendix L, Section 1.7 and DPW-ENRD requirements.

f. A Tree Protection Plan shall be prepared in accordance with DPW-ENRD requirements and included with the 35 percent design submittal.

g. Dogwood, Holly, Redbud, and Mountain Laurel are to be left standing on utility rights-of-way unless an exception is specifically approved in writing by DPW-ENRD.

5. Proponent. The Directorate of Public Works is the proponent for this policy at 703-806-4142.

ANGIE K. HOLBROOK
Colonel, AG
Commanding

Appendix D

Fort Belvoir Management Plans

Department of the Army
Headquarters, U.S. Army Garrison Fort Belvoir
Fort Belvoir, Virginia

Integrated Pest Management Plan
FY 2016

Revised Aug 2015 By:

STEVEN E. WATTERS
Installation Integrated Pest Management Coordinator
Fort Belvoir, Virginia

Reviewed By:

FELIX M. MARIANI
Chief, Environmental and Natural Resources Division
Fort Belvoir, Virginia

BILL L. SANDERS
Director, Public Works
Fort Belvoir, Virginia

EDGAR ECHEVARRIA, CAPT
Chief, Public Health
Fort Belvoir Community Hospital
Fort Belvoir, Virginia

NANCY E. JOHNSON, M.S. D.V.M.
Fort Belvoir Branch Veterinary Services
10015 Theote Road, Suite 101
Fort Belvoir, Virginia 22060-5441

Approved By:

MICHELLE D. MITCHELL
Colonel, U.S. Army
Commanding

TECHNICAL APPROVAL:

WILLIAM B. MILLER, Ph.D.
Pest Management Consultant
US Army Environmental Command

APPENDICES (maintained in IPMC Office)

EXECUTIVE SUMMARY

Purpose

This plan describes a comprehensive Integrated Pest Management (IPM) program for Fort Belvoir, Virginia. IPM is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks. Federal agencies are mandated by Section 136 et seq. of Title 7, United States Code, "Federal Insecticide, Fungicide and Rodenticide Act 1976 (FIFRA) as amended" to use IPM. This plan is a guide to reduce reliance on pesticides and to enhance environmental protection. It reflects current Department of Defense (DOD)/Department of Army (DA) policies, procedures and standards, and incorporates the requirements of the Environmental Protection Agency (EPA) and the Commonwealth of Virginia. Adherence to the plan ensures compliance with applicable laws and regulations as well as with current IPM practices and principles.

Scope of the Integrated Pest Management Plan

The contents of this plan apply to all organizations, tenants, contractors, subcontractors and private partners performing pest management operations on Fort Belvoir. All organizations on Fort Belvoir are required to contact the Directorate of Public Works (FB-DPW) for pest management contract support, review and compliance in accordance with applicable Federal, State and local laws and Inter-service/Intra-service Support Agreements specifying responsibilities for pesticide applications, records and contracts.

The IPM plan for Fort Belvoir describes the installation's pest management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety and environmental requirements of the program. This plan is a working document and is continually updated to reflect current management practices, industry standards, regulatory requirements and installation coordination. IPM operations on Fort Belvoir include both state-certified privately contracted pest management technicians as well as DOD-certified Government personnel. Pests included in the plan are weeds and other unwanted vegetation, termites, mosquitoes, crawling arthropods (e.g., ants, crickets, cockroaches, spiders, ticks, etc.), leaf defoliators (e.g., eastern tent caterpillars, gypsy moth caterpillars), mice, moles, and other vertebrate pests. Without control, these pests could interfere with the military mission, damage real property, increase maintenance costs, and expose installation personnel to diseases.

Program Objective

The IPM objective is to identify operational procedures that use the least toxic method to control pest populations in a cost-effective, environmentally sound manner. IPM is a planned decision-making process that incorporates education, record keeping and best management practices to prevent pests and diseases from causing damage to personnel and property. At no time will pest management operations be done in a manner that will cause harm to personnel or the environment. Non-chemical control efforts will be used to the maximum extent possible before pesticides are used.

Authority

Army installations conducting either in-house or contracted pest management operations are required to prepare a written installation pest management plan that is to be reviewed and updated annually. The installation pest management plan is to be based on the IPM philosophy. The IPM philosophy of pest control shall be used for all pest control activities conducted at the installation. The following IPM Plan was prepared for Fort Belvoir in accordance with the following regulations:

a. Section 136 et. Seq. of Title 7, United States Code, "Federal Insecticide, Fungicide, and Rodenticide Act" (FIFRA) as amended.

b. DOD Instruction 4150.07, "DOD Pest Management Program", 28 May 2008.

c. Army Regulation (AR) 200-1, "Environmental Protection and Enhancement", 13 December 2007.

Table of Contents

1.0 U.S. ARMY GARRISON FORT BELVOIR

1.1 Fort Belvoir History

Fort Belvoir is an 8,656-acre United States (US) Army installation located in Fairfax County, Virginia. The installation was originally established in 1912, as Camp A.A. Humphreys, to provide training grounds for Army engineers stationed in the Washington Barracks at Fort McNair. On December 23, 1917, Congress approved the official transfer of the US Army Engineer School to the post. In 1935, Camp A.A. Humphreys was designated as Fort Belvoir, in honor of the historic Belvoir plantation. The installation trained engineers until June 1, 1988 when the Engineer School was officially moved to Fort Leonard Wood, Missouri. On October 4, 2006, Fort Belvoir was transferred from the Military District of Washington (MDW) to the Installation Management Command (IMCOM). Under the Base Realignment and Closure (BRAC) Act of 1988, Fort Belvoir developed as the principal administrative, housing and logistics center of the US Army in the National Capital Region. Under the BRAC Act of 2005, Fort Belvoir anticipates an increase in on-post military/civilian population from 29,978 to more than 49,000. Over the past two decades, Fort Belvoir has privatized utility services (gas, electric, water and wastewater) and Army Family Housing. Fort Belvoir Lodging and Unaccompanied Personnel was privatized in August 2011 under the Army's Privatized Army Lodging (PAL) Initiative.

1.2 Mission Statement

Fort Belvoir exists to: operate and maintain our installation; provide quality installation support and services to our customers; and, execute mobilization requirements, military operations and contingency/force protection missions. Our vision of Fort Belvoir for the 21st century is: to serve as a regional center where our customers receive premier support services; to provide a superior place to work, train, and live; and, to foster an innovative and professional team that meets the challenges of change, while maintaining harmony with the environment and surrounding communities.

Although its role as an engineer training center diminished after the move of the Engineering School, Fort Belvoir continues to fulfill an important and valuable military mission support role today. Fort Belvoir houses tenants from all armed forces, as well as such Department of Defense (DOD) agencies as the Defense Systems Management College and the Defense Mapping School. To carry out this mission effectively, Fort Belvoir has evolved from a traditional military installation to a more broadly based community. Today, Fort Belvoir functions in many ways like a small city, with its own ordinances, land-use plan, building codes, utilities, public parks, and academic institutions.

2.0 RESPONSIBILITIES (DOD INSTRUCTION 4150.07, page 13, E2.11)

2.1 Garrison Commander

a. Designate an Installation Integrated Pest Management Coordinator (IPMC) for all pest management activities.

b. Approve and support the Integrated Pest Management (IPM) Plan.

c. Ensure installation personnel performing pest control receive adequate training, and achieve pest management certification, as required.

d. Ensure all pest management operations are conducted safely and have minimal impact on the environment.

2.2 Director of Public Works (DPW)

a. Determine pest management requirements for the installation.

b. Initiate requests for aerial application of pesticides when necessary.

c. Request and monitor contract pest management operations.

d. Ensure pest management operations comply with applicable laws and regulations and that equipment and facilities meet Fort Belvoir's needs for personal health protection and the protection of real property.

e. Maintain adequate records of pest management operations.

2.3 US Army Medical Department Activity (USAMEDDAC), Fort Belvoir, Public Health Service

a. Conduct surveillance for pests that could adversely affect the health and welfare of the installation.

b. Coordinate with local health officials to determine the prevalence of disease vectors and other public health pests in the area surrounding the installation.

c. Monitor pesticide sales at Commissary and Post Exchange System.

d. Evaluate health aspects of the pest management program.

2.4 US Army Veterinary Command), Fort Belvoir, Veterinary Services

a. Conduct surveillance for pests that damage or destroy food stored in installation facilities.

b. Report the occurrence of zoonotic diseases seen in military/companion animals at the veterinary treatment facility to Public Health Service and local health agencies.

2.5 Installation Integrated Pest Management Coordinator (IPMC)

a. Prepare, monitor, and update the installation Integrated Pest Management (IPM) Plan.

b. Coordinate with activities conducting pest surveillance or controlling pests to ensure all applicable information is recorded and reported as required by this Plan.

c. Function as liaison between those individuals who store and apply pesticides (e.g., public works, golf course, pest control contractors, and tenant activities) and activities or individuals who document or deal with pesticide use in their programs (e.g., Environmental Office, Safety Office, Fire Department, Industrial Hygienist).

d. Monitor certification and continuing pest management training for pesticide applicators on the installation.

e. Coordinate and monitor contracts dealing with pesticide application and keep a copy of each contract on file.

f. Coordinate with local, State and Federal agencies as necessary to conduct the installation's pest management program.

g. Answer pest management questions from the Garrison Commander, the Army Environmental Command (AEC), and Department of the Army (DA).

h. Monitor sale and distribution of pesticides on the installation.

i. Submit pest control contracts to AEC for review and approval by AEC Pest Management Consultants (PMC's).

j. Annually submit IPM Plan to AEC PMCs for review and approval IAW DODI 4150.07, paragraphs 5.4.20.1 and E4.2.1.6

k. Submit the following forms to the AEC PMCs, as required, Annual Plan Update Form (PUF); Out-of-Cycle Pesticide Use Request (OCPUR); Pesticide Use Proposal (PUP).

2.6 Building Occupants

a. Apply good sanitary practices to prevent pest infestations.

b. Use all IPM control techniques such as good housekeeping practices, pest exclusion, snap traps, glue boards and structural repairs before requesting further assistance from FB-DPW.

c. Apply only those pesticides approved by DOD, DA and FB-DPW.

d. Cooperate fully with FB-DPW personnel, Fort Belvoir Residential Community (FBRC) housing management personnel and contractors in scheduling pest management operations to include preparing the areas to be treated.

2.7 Pest Management Contractor (Government)

a. Use IPM control techniques to the maximum extent possible.

b. Control pests in accordance with current Fort Belvoir IPM Plan and IPM Policy Letter.

c. Operate in a manner that minimizes risk of contamination to the environment and personnel.

d. Ensure superiors are informed of changes in pest management requirements.

e. Request pest management supplies and equipment in a timely manner.

f. Maintain effective liaison with installation health and environmental officials and provide certification and pesticide data in a timely manner.

2.8 Field Sanitation Teams

a. Unit Level Field Sanitation Teams (FST) using pesticides approved according to FM 4-25.12 are required to maintain records of usage in unit journals according to FM 4-02.17.

b. Unit Level FST's using pesticides not approved by FM 4-25.12 are required to report all pesticide usage to IPMC and document usage in unit journal according to guidance in FM 4-02.17.

2.9 Golf Course

a. Golf Course personnel who apply pesticides will adhere to Federal, DOD, DA, and Fort Belvoir requirements for certification, use of approved pesticides and pesticide use reporting.

b. Golf Course Superintendent will submit annual pesticide approval requests by September 1st each year.

2.10 Private Partners

a. This includes the electrical, sewer, water and gas companies who are required to follow all Federal, DOD, DA and Fort Belvoir directives, regulations and policies.

b. These companies are required to submit an annual pesticide usage proposal to IPMC by September 30th each year.

3.0 GENERAL

3.1 Installation Description

a. **Background (Topography):** Fort Belvoir comprises an area of approximately 8,656 acres and is located at the Fall Line between the Piedmont and Coastal Plain physiographic provinces. The land is crossed periodically by water drainage systems that create deep coves and a flat alluvial bottomland. Elevations range from Potomac River level to +245 feet. Although Fort Belvoir lies in the Coastal Plain Physiographic Province, it also has some of the characteristics of the Piedmont region of Virginia. The northwestern edge of the installation is between 1.25 and1.5 miles from the Fall Line. The land is gently to moderately rolling, with varying slopes. For general classification purposes, the land can be divided into four classes: Bottomland, Coves, Slopes, and Upland.

b. **Surface Water Resources and Wetlands:** Three major streams (Dogue Creek, Accotink Creek) pass through Fort Belvoir before discharging to the Potomac River. The southern reaches of these major streams, as well as the Potomac River, are within/adjacent to the installation. Extensive wetlands occur both on the installation and adjacent to the installation.

The surface waters on and adjacent to Fort Belvoir are known to support approximately 60 fish species including anadromous and catadromous species (e.g., river herring and eels). The on-post streams generally retain their natural bank and channel conditions and most have forested riparian areas. There are no wastewater treatment plant discharges on post. The principal source of impact to the installation's waters comes from excessive/unmanaged storm water flow originating from both on-post and off-post.

c. **Climate:** The climate of Fort Belvoir is classified as modified continental. Summers are warm and humid, with occasional hot and dry periods. Winters are moderately cold with the principle form of precipitation being rain, although there may be several snow days each year. The mountains to the west act as a partial snow barrier to the continental cold air in the winter. In winter, the average temperature is 36.8°F. The lowest temperature on record is 10°F. In the summer, the average temperature is 75.5°F, and the average daily maximum temperature is 87.3°F. The highest recorded temperature is 106°F.

The average annual rainfall is 36.3 inches. Of this, 20.2 inches, or 56%, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16.3 inches. The heaviest recorded one-day rainfall was 9.1 inches on June 21, 1972. Thunderstorms occur about 11 days each year, and most occur in the summer. Average seasonal snowfall is 15.3 inches. The greatest snow depth at any one time during any known period of record is 24 inches.

The average relative humidity in the mid-afternoon is about 50%. Humidity is higher at night, and the average at dawn is about 80%.

The sun shines 70% of the time in the summer with 30% cloud cover the remainder of the time and about 50% of the time in the winter. The prevalent wind is from the south. The average wind speed is eight miles per hour in the spring.

d. **Geology:** (Information drawn from Drake et al. referenced in paragraph 3.1.f.) Fort Belvoir lies within the Coastal Plain Physiographic Province that consists of a wedge of generally unconsolidated sediments that dip and thicken to the east. The sediments underlying Fort Belvoir are all of the Potomac Formation, early Cretaceous in age. They range from around 20 feet thick near Telegraph Road north of Davison Airfield to 400 feet thick at the entrance to the Dogue Creek Estuary. Thin beds of Miocene to Pleistocene terrace deposits on the plateau and Holocene deposits in the creek beds overlie them.

The Potomac Formation is principally varicolored clay and silt inter-bedded with sand, pebbly-sand, and gravel in fairly well bedded inter-fingering fluviatile deposits. It unconformably overlies saprolite and crystalline rocks of lower Paleozoic age. There are two facies in the Potomac Formation. The clay facies is composed of predominantly red-brown, green, and gray silty and sandy clay with minor lenticular sands. The sand facies is predominantly buff to gray, fine- to coarse-grained pebbly felspathic sands with minor lenticular clay and silt beds.

On Fort Belvoir, ground water is drawn from Lower Potomac Aquifer for irrigation purposes only.

e. **Soil Data:** Soils consist almost entirely of Coastal Plain sand, silt, clay and gravel of marine or fluvial origin that overlies the Piedmont Upland material. Specific soils that can be found on Fort Belvoir consist of, but are not limited to, Beltsville, Dumfries, Matapeake, Lunt and Wehadkee. The US Department of Agriculture Soil Conservation Service (USDA SCS) completed a soil survey of Fort Belvoir in 1981. Survey maps are available in the Fort Belvoir Geographic Information System (GIS). Detailed Fort Belvoir soil data can also be found in the Fort Belvoir Integrated Natural Resources Management Plan (INRMP), which is available on the Fort Belvoir website.

f. **Other:** More-detailed topography descriptions, geology, hydrology, climate, major soil association, vegetation, petroleum and minerals can be found in the Fort Belvoir INRMP and GIS. Additional source documentation is provided in "Drake AA, Nelson AE, Froelich AJ, and Lyttle PT., 1979. Preliminary Geologic Map of Fairfax County, Virginia. US Geological Survey Open File Report 79-398." The Fort Belvoir Environmental Office (the Environmental and Natural Resources Division of the Directorate of Public Works (FB-DPW ENRD)) maintains copies of the INRMP, wetland delineations data and spill plans. As necessary, these documents are used whenever pesticide application is considered in order to evaluate the potential fate and impact on natural resources.

g. **Fort Belvoir North Area (FBNA)/Formerly Engineer Proving Ground:** FBNA is a former military training and testing area on an 807-acre, noncontiguous portion of the installation approximately 1.5 miles northwest of the Main Post. FBNA is bounded by I-95 to the east and by commecial and residential properties to the north, west and south. FBNA is further inland and on higher ground than the Main Post. Accotink Creek traverses FBNA from north to south, dividing it into two nearly equal parts. Broad level terraces are present on each half of the site. The Army acquired FBNA in the early 1940s for the testing of a wide range of engineering equipment and supplies including methods and equipment for the deployment, detection and neutralization of landmines. The Army used FBNA for these purposes from the 1940s through the 1970s. The FBNA property was returned to Fort Belvoir from the Research, Development and Engineering Center in 1989. Little activity took place at FBNA after the transfer until the recent cleanup and construction associated with BRAC 2005 throughout most of the site and construction of the Fairfax County Parkway on a 170-acre tract of land along the western and southern boundaries.

h. **Rivanna Station:** Rivanna Station, also known as the National Geospatial and Intelligence Center (NGIC) facility, encompasses 76 acres located in Albemarle County, Virginia north of the City of Charlottesville. The topography of the Rivanna Station property consists of a moderately narrow ridge approximately 500 feet above mean sea level. From this ridge, several mapped subdrainages flank the north, east, south and western corners of the site. One mapped perennial stream (Herring Branch) along with a mapped intermittent system flow south into the North Fork of the Rivanna River.

3.2 Inventory of Land Use and Layout of Facilities

a. **Inventory of Land Use:** There are two categories of grounds on Fort Belvoir: improved and unimproved. The following acreages include Fort Belvoir Main Post, FBNA and Rivanna Station. The Real Property Planning Division, Bldg. 1442, 703-806-0043 /0853, gathers all Real Property information on an annual basis. Contact Chief, Facility Planning Division, for information and periodic updates.

(1) **Improved Grounds:** Building sites and other improved grounds occupy about 25% of Fort Belvoir's land area. The grounds maintenance program includes soil analysis tests, fertilizing, liming, lawn care, landscape plans and plantings, integrated pest control, tree maintenance, recycling and compost program, and an integrated weed and brush management program.

(a) Improved grounds include acreage on which intensive maintenance activities are planned and performed annually as fixed requirements. These activities include pest management, mowing, irrigation, dust and erosion control, drainage maintenance, weed and brush control, planting for landscape benefits, and other intensive practices.

(b) Fort Belvoir contains a total of approximately 1,902 acres of developed land that requires intensive annual maintenance. Summaries of the breakdown of ground area and developed land are found in Table 1. The table is subject to change.

(2) **Unimproved Grounds:** Unimproved grounds include surfaced areas, woodlands and other areas that require little or no maintenance. Activities on unimproved grounds do occur, but not on a regular basis, and are generally unpredictable and dependent upon mission activities.

(a) Unimproved grounds include natural and planted woodlands as well as most active and terminated training lands. Activities on these grounds do not occur regularly and are generally unpredictable depending upon mission activities and changing conditions due to flood, fire, insects, and other variables.

(b) There are approximately 4,823 acres of woodlands at Fort Belvoir that require little or no maintenance.

TABLE 1. Summary of land areas by use classification for Fort Belvoir, VA

CLASSIFICATION:	APPROXIMATE ACREAGE:	% OF TOTAL
Improved Grounds (Athletic Fields, Turf Areas Mowed), Golf Courses, Parade Fields, Cemeteries, Airfields and Landscape)	1,902	25%
Unimproved Grounds (Woodlands, Planted Forest Lands, Training, Asphalt, Buildings, etc.)	6,904	75%
TOTAL:	**8,806 acres**	**100%**

Layout of Facilities: The geographic regions on Fort Belvoir are:

Main Post: Fort Belvoir is located within Fairfax County's Lower Potomac Planning District. The majority of improved facilities are located on uplands and plateaus that run south-southeast from north of US Route I to the Potomac River and make up approximately 40% of the land area. Fort Belvoir has a total population (military and civilian) of approximately 39,000.

Adjoining Jurisdictions: Fort Belvoir Main Post abuts and/or politically and economically interacts with Fairfax County.

Installation Interface: Fort Belvoir abuts or politically and economically interacts with Albemarle County (Rivanna Station) and Fairfax County in the following ways:

Easement Rights of Way Across Installation Property

Licenses and permits

Installation Out-leases - Fort Belvoir does not currently have out-leases.

3.3 Plan Maintenance

a. The IPMC, 703-806-0684 (DSN: 656-0684), maintains the IPM Plan. Pen and ink changes are made to the plan throughout the fiscal year. The Plan is reviewed and updated annually to reflect all changes made in the pest management program during the fiscal year.

b. Annual updates, including a pesticide use proposal, are sent to the AEC Pest Management Consultant.

4.0 PRIORITY OF PEST MANAGEMENT

This section provides background information on each pest category and the specific pests requiring control at Fort Belvoir. From early March to late November, roaches, bees/wasps, ants, flies and fleas constitute the most important pests from the standpoint of general annoyance. Ticks, mosquitoes, spiders, bees/wasps and copperheads constitute the most important pests from the standpoint of disease transmission or medical threats.

4.1 Disease Vectors and Medically Important Arthropods

Disease vectors are those animals and insects that are capable of maintaining and transmitting diseases to man. Fort Belvoir routinely performs pest control activities in response to several pests that are potential carriers of disease. A few of the potential disease vectors found at the installation are detailed below in their order of significance.

a. **Mosquitoes:** Mosquitoes are potential vectors of human disease including West Nile Virus (see section 4.10). Mosquitoes are considered to be some of Fort Belvoir's' most important disease vectors and can be found throughout the installation including off-post annexes and housing areas. Active duty personnel can minimize the nuisance and vector potential using the DOD Arthropod Repellent System. Other personnel conducting outdoor activities, especially during the early evening hours, can minimize the mosquito nuisance by wearing proper clothing (minimizing exposed skin surface) and utilizing an appropriate mosquito repellant.

(1) Mosquitoes represent one of the most important groups of vectors from the standpoint of disease transmission potential. Mosquitoes are capable of transmitting a number of diseases to man. The encephalidites (encephalitis = inflammation of the brain) are the most common mosquito-borne diseases in the US and continue to be a significant health problem in many parts of the US.

(2) With West Nile Virus permanently established in the US as well as other mosquito borne diseases, the monitoring, surveillance and control of mosquito populations will continue to be a major IPM requirement. Fort Belvoir serves as a major Housing, Recreation and Administration Support Center. Mosquito control is to be initiated and coordinated with Environmental Health and Medical personnel based upon surveillance data and established thresholds. Habitat management and reduction of breeding sites are the primary objectives in the control of mosquito populations. Adult mosquitoes rarely require fogging for control. Coordination for mosquito control on lakes and ponds is discussed in Section 9, this plan.

b. **Ticks:** Ticks are of significant concern at training sites, in housing areas and sites where maintenance personnel cut brush and weeds during the summer months.

The US Army Center for Health Promotion and Preventive Medicine (USACHPPM) provides support in conducting arthropod surveillance. Ticks can be controlled by clearing and controlling brush and weed growth, using repellents and visual inspection of oneself after exposure. For severe infestations, chemical control may be necessary.

(1) The tick population at Fort Belvoir is of concern as both a nuisance and a disease vector. Troops training at Fort Belvoir can be expected to encounter large numbers of ticks, particularly along the edges between wooded habitats and open field areas. Units training on Fort Belvoir are required to maintain adequate field sanitation teams and supplies. Personnel conducting outdoor activities can minimize the tick nuisance by wearing appropriate clothing, applying tick repellant and performing personal hygiene inspections (with bathing) upon return to camp.

(2) In addition to the nuisance problems, ticks are capable of transmitting a number of diseases to man. Of these, the most serious and most likely to be encountered at Fort Belvoir is Lyme disease, most commonly transmitted by the deer tick, *Ixodes scapularis*. The deer tick is most common in the northeastern US; however, its range appears to be broadening.

(3) Past tick population studies, conducted by USACHPPM, have identified two common tick species at Fort Belvoir. The American dog tick, *Dermacentor variabilis*, is the primary vector of Rocky Mountain Spotted Fever (RMSF). RMSF is a rickettsial disease endemic to the Mid-Atlantic States and the middle Mississippi Valley, but less common in the Rocky Mountains, where it was first described. The lone star tick, *Amblyomma americanum*, is a suspected vector of RMSF, but is considered an unlikely vector in Virginia. However, it is the probable vector of the emerging disease human monocytic ehrlichiosis (HME).

(4) Conclusions drawn from USACHPPM Vector-borne Disease Assessment No. 18-NF-5985-97, conducted in June 1997 and annual tick surveys by Preventive Medicine personnel indicate that the overall risk of humans contracting RMSF or HME at the installation still appears to be small. However, frequent or repeated contact with active tick habitats would increase the risk of infection. Control of tick populations may be warranted as long as the mission of the installation calls for troop training exercises.

c. **Rodents:** Rodent populations are of concern due to their potential as disease vectors and due to damage they can cause to facility structures and their contents. There are a number of diseases that rodents can transmit to man. Most diseases are transmitted to man via rodent bites or through contact with soils, water, or food contaminated with infected rodent fecal matter and/or urine.

(1) Rats and mice routinely damage buildings and/or structures because of their attempts to gain entry, reach stored foods, or create a nest or den. Their efforts often result in widened openings where pipes or wires pass through exterior walls. Within buildings, rats and mice will enlarge existing openings or create new ones in walls, doors, cabinetry and furniture.

(2) Mice frequently nest around stationary electrical appliances, damaging wires and affecting appliance performance. Odors from feces and urine are generally offensive to most people, as is any destruction of personal property. Rodent control is periodically required in the various buildings located on site. Mice are controlled with snap traps, glue boards, or poison and by eliminating holes, cracks and other entry areas.

d. **Bees/Wasps:** Bees and wasps are found throughout the installation. Their stings are painful and may cause allergic reactions in some people. Bees and wasps are a common problem on Fort Belvoir. Yellow jackets, hornets, and wasps also cause problems on Fort Belvoir. About five to ten nests a day are removed in July, August, and September. Nests are either treated or removed by hand. Carpenter bee holes are sprayed and caulked.

e. **Spiders:** There is the potential to find black widow (*Latrodectus mactans*) spiders in undisturbed places in warehouses, training site restrooms, family housing storage areas and in and around other buildings. Due to training and education, Fort Belvoir personnel encounter few, if any, problems. Bites are treated/reported by DeWitt Hospital.

Brown recluse spider (*Loxosceles recluse*) is becoming an occasional pest in housing areas due to the frequent movement of active duty personnel.

f. **Poisonous Snakes:** Copperhead snakes are a minor problem in early spring, summer, and fall in both training and housing areas. They may be encountered, especially, in training areas. Soldiers are briefed and trained to avoid contact with all snakes. Any bite is treated as a potential medical emergency.

g. **Bed Bugs:** Bed bugs are becoming a major threat to occupants of temporary lodging facilities on the installation. Bed bugs possess all of the prerequisites for being capable of passing diseases from one host to another, but there have been no known cases of bed bugs passing disease from host to host. There are at least twenty-seven known pathogens (some estimates are as high as forty-one) that are capable of living inside a bed bug or on its mouthparts. Extensive testing has been done in laboratory settings that also conclude that bed bugs are unlikely to pass disease from one person to another. Bed bugs are less dangerous than some more common insects such as the flea, however, transmission of Chagas disease or hepatitis B might be possible in appropriate settings. Bed bugs are annoying to man due to their blood sucking habits which may produce dermatitis (inflammation of the skin) in hyper-sensitive individuals.

4.2 Stored Products Pests

a. Stored product pests historically have not represented a major recurring pest problem at Fort Belvoir. Minor spot infestations have been routinely identified by

building occupants and/or visiting inspectors and were addressed on an as-needed basis by the Pest Controller. Pest control personnel also conduct trap monitoring.

b. Saw-toothed grain beetles and confused flour beetles have been identified in storage facilities. A routine surveillance program and preventive maintenance program have been developed for control of these pests. Food items stored in the commissary, the AAFES Shoppettes, and food stored in food service facilities may occasionally become infested by stored products pests. Occasional complaints are received from family housing residents. Some of the pests found in stored food in the past include saw-toothed grain beetles, red flour beetles, rice weevils, Indian meal moths and dermestids.

4.3 Animal Pests

Animal pests periodically require control. Management of these populations is conducted mainly in response to isolated incidents. Non-chemical control is strongly encouraged for the management of these pest populations. Trapping and exclusion from structures is used to contain or control these animals. The species described below may be encountered anywhere on Fort Belvoir.

a. **Non-Poisonous Snakes:** Non-poisonous snakes are present in virtually every conceivable habitat in the world. Snakes, while not a major pest problem at Fort Belvoir, are of seasonal concern. Nuisance areas include the camps and training areas occupied by visiting troops. Snakes in housing areas are controlled using good sanitation and mechanical control methods.

b. **Birds/Bats:** Birds/bats are a potential problem on Fort Belvoir year-round. The control of bird species, excluding pigeons (Rock Doves), European starling, and the house/English Sparrow is protected by the Migratory Bird Treaty Act (MBTA) and a permit issued by the US Fish and Wildlife Service is required before impacting MBTA species to include their nests and eggs. The major bird problem occurs during the hatching season when birds get into the vents in family housing and under the eaves of the administration buildings or when birds are identified as the potential cause of mite infestations (a secondary threat of infestation within buildings). Sometimes birds or bats fly into the buildings and have to be removed. The high nutrient content of accumulated bird and bat excrement provides an excellent growth medium for organisms of potential human health concern. The two primary diseases caused by potentially harmful organisms include cryptoccosis and histoplasmosis. Rabies in bats is also an issue of special concern. Although bats are potential carriers of the disease, only a few human fatalities have been attributed to bats. The Northern Long Eared Bat (NLEB) was listed by the U.S. Fish and Wildlife Service as a Threatened Species in May 2015. NLEB is considered to be present on Fort Belvoir. This bat may occur in a variety of habitats including buildings and other man-made structures. Fort Belvoir pest control contractors will follow the guidelines as stated in the IMCOM Final NLEB Programmatic Conference dated 4 May 2015 and IMCOM Northern Long Eared Bat Concurrence

Letter dated 4 May 2015 and included as L-1 and M-1 respectively in the Annexes to this plan. Nevertheless, caution and care is used when handling bats. All bat removal work must be coordinated with the Natural Resources Manager in advance. During removal, precautions detailed in USACHPPM TG No. 142 are strictly followed.

c. **Stray Dogs and Cats:** Stray dogs and cats occasionally need to be captured on the installation. The Pest Control Technicians and/or Military Police accomplish stray animal control in the Main Post area. The use of special animal handling gloves and other personal protective equipment to protect against rabies and other potentially harmful diseases is mandatory on Fort Belvoir.

d. **Beavers:** Beavers (*Castor canadensis*) have the ability to reach nuisance levels within the Fort Belvoir system and are recognized as a growing issue throughout the state of Virginia. The beaver population on the installation has caused, and continues to cause damage to bottomland timber stands and the expenditure of resources to clean out culverts and repair roads damaged by beaver impoundments. It must be recognized that while beavers can and do, constitute a nuisance on the installation, their construction of numerous shallow impoundments results in the creation of wetland and waterfowl habitats that have incalculable benefits to wildlife populations. Beaver conflicts are controlled by removing beaver dams where they interfere with facilities and roads and by installing beaver deterring structures. All control activities are coordinated with the installation Natural Resources Manager.

e. **Other Animal Pests:** Skunks, raccoons, and foxes also exist on Fort Belvoir. They may occasionally enter the vicinity of administrative areas to prey on small pets. Over the past few years, there has been a marked increase in the number of rabies cases in wild carnivores in Fairfax County.

4.4 Real Property Pests (Structural/Wood Destroying Pests)

From an economic perspective, termites are the most detrimental structural pests found on Fort Belvoir because of their ability to destroy wood in structures. In recent years, termites have been identified as the only structural pests requiring appropriate management and control at Fort Belvoir. Termites are one of a limited number of organisms capable of breaking down the cellulose in wood. Consequently, the wood framed structures present at Fort Belvoir are susceptible to infestation by termites. If left uncontrolled, termites may cause significant damage to wood frame buildings. Other potential future pest threats from this category include powder post beetles and carpenter ants. The damage done by other structure pests, such as powder post beetles and carpenter ants, is not a regular occurrence. The Fort Belvoir inspection process usually identifies infested structures. Periodic surveys of wooden structures and treatment when termites and/or other Real Property Pests are found have kept damage to a minimum. Carpenter ants, although currently not a pest of significance, may occasionally invade wooden structures, particularly where wet conditions exist.

a. **Termites:** Termites have been identified as the only structural pest requiring control at Fort Belvoir. All wood buildings and structures shall be visually inspected on an annual basis to determine termite presence if possible. Survey procedures include crawl space investigation as well as inspections of internal areas of each building.

b. **Powder Post Beetles:** Over the years, the number of powder post beetles infestations in structures has not been excessive. In most cases, replacing the old wood eliminates the problem.

c. **Carpenter Ants:** Carpenter ants are potential threats in most of the older buildings on Fort Belvoir because they either have a wood frame construction or have aluminum siding. Carpenter ants usually nest in damp wood and in-between aluminum siding. Carpenter ants work in wood to excavate nest galleries. They do not digest it.

d. **Carpenter Bees:** Carpenter bees are a continuous problem during the months of May, June, July, and August.

4.5 Household and Nuisance Pests

Flies and crawling insects (ants, cockroaches, crickets, beetles, etc.) and spiders may require control in billets, family housing, food service facilities, warehouses, offices and other administrative buildings. All pests contained in this category are regarded primarily as household and nuisance pests; however, many are also potential disease vectors.

a. **Cockroaches:** Cockroaches are currently a minor problem; however, they still pose the greatest potential nuisance pest control problem due largely to inadequate insect proofing of old pre-World War II facilities and inadequate troop sanitation practices. Cockroaches have been shown to carry organisms that cause salmonellosis, dysentery, and typhoid fever. Cockroaches may deposit these disease organisms on food products, whether in semi-permanent storage or ready for human consumption. Wherever lax sanitary conditions exist, large cockroach populations can be expected. Housing units are inspected and treated, if necessary between and during each occupancy. Dining facilities and food service areas are inspected by Preventive Medicine on a monthly basis and treated where problems occur only after surveillance. The most common places for roaches are food service areas, barracks, dorms, Bachelor Enlisted Quarters, Visiting Officer Quarters, and General Officer Quarters. Cockroaches make up less than 10% of the pest management workload. Most of the person-hours spent are on surveillance, not control. The remainder of the pests in this category constitutes minor pest problems on the installation. Proper sanitation and housekeeping will do much to discourage these pests.

b. **Flies:** Flies are considered to represent a threat to individual efficiency and the morale of the entire installation community. Their main characteristic is that of a nuisance pest; however, flies have been found to carry organisms that cause typhoid,

dysentery, and other diarrheas. Flies are mainly a nuisance during the summer and early fall. Control of flies is primarily through elimination of breeding habitat, prevention of entry into buildings, high sanitation levels, cleaning dumpster boxes, and timely disposal of wastes. Serious infestations and nuisance problems are treated after hours. Application of any pesticide to a fly breeding site, dumpsters, garbage can, etc., is strictly prohibited.

c. **Fleas:** Fleas sometimes are a problem, mainly in housing units that have pets or wild animals living under the structure. Use of systemic pesticides in companion animals is also an alternative available by prescription from the Fort Belvoir Veterinary Treatment Facility. Fleas can be medically important because they serve as vectors of disease. Fleas can be annoying to man due to their blood sucking habits, which may produce dermatitis (inflammation of the skin) in hypersensitive individuals.

d. **Other:** The remaining pests in this category represent nuisance pests that, when occupying internal areas of buildings, can affect efficiency and morale of building occupants.

(1) Spiders: Spiders (e.g., American house spider) are very common in the housing units. Inside spiders are controlled by sweeping, or vacuuming around baseboards and window frames.

(2) Ants (Pharaoh): Ants are very common on Fort Belvoir, especially in the older wooden buildings. Pharaoh ants prefer warmer buildings and warm areas (80-85°F) in buildings for nesting. These ants are active year-round in houses and portions of large buildings such as clinics, hospitals, office buildings and labs. Nesting sites include wall voids, cracks in woodwork, and stacks of paper, envelopes, bed linens, bandage packs and desk drawers. Pharaoh ants trail each other and are attracted to grease, meats, insects, and sweets. Special precaution is taken to prevent ant entry into administrative areas where food is present, Child Care Facilities and Medical Treatment Facility patient care areas. Pharaoh ants are treated with pesticide spray, powder and/or baits. Most control calls come from family housing or administration buildings.

(3) Ants (Thief): Thief ants are a potential problem year-round. They nest inside and outside and tend honeydew-producing insects.

(4) Bird Mites: Urban pest problems ranging from imaginary itches to suspected cases of pubic lice may be eventually diagnosed as bird mites. Bird mites sometimes infest Family Housing units or offices due to maintenance and resource constraints. Mites are controlled in conjunction with bird and nest removal.

(5) Crickets: Crickets are a common pest in the family housing and office areas on Fort Belvoir. Occasionally, they are found in dark moist damp areas, but seldom require chemical control.

(6) Earwigs: Earwigs are a seasonal problem on post, lasting typically about six weeks in early fall and mainly in family housing. They live under the slabs and eaves of houses. Units are sprayed with a labeled pesticide and occupants are encouraged to keep the vegetation down around the house and debris cleaned up to control them. Occasionally, they are also found in dark moist damp areas, but seldom require chemical control.

4.6 Ornamental Plant and Turf Pests

Various insect pests, resulting in damage or destruction of plants, can infest trees and shrubs on Fort Belvoir. Bagworms and other pests have caused minor problems annually and have required mostly mechanical control on the installation in recent years. Pests that damage lawns require continuing surveillance and control.

a. **Bagworms:** Bagworms occasionally attack junipers and cedars. These pests may require treatment, usually in late July.

b. **White Grubs:** White grubs (Japanese beetle and June beetle larvae) are a pest of turf areas such as parade fields and yards. Biological/chemical control may be necessary if populations reached control threshold levels.

c. **Fall Webworm:** The fall webworm is a minor problem on Fort Belvoir trees around housing and improved grounds areas. Webworms are controlled by cutting them out and spraying if needed. This pest threat is usually recognized and treated before residents call for support.

d. **Tent Caterpillars:** Tent Caterpillars are an annual occurrence on Fort Belvoir. They can be found in host trees (e.g., wild cherry) around the installation. They are controlled by direct removal. Normally, spraying is not required unless an ornamental plant is threatened.

e. **Gypsy Moths:** Gypsy moth populations have been on the decline since the early 1990's. Because of the recent introduction of Asian gypsy moths into the US, Virginia agriculture and forestry officials have initiated increased annual gypsy moth surveillance programs to track the movement and reduce the tree defoliation threat of this voracious pest. Fort Belvoir coordinates and provides surveillance data working with local, state, federal agriculture and forestry officials.

f. **Cankerworms:** Cankerworms are an indigenous, leaf-eating species that generally do not cause sufficient damage to trees to warrant spraying. Following a severe nuisance outbreak in Fort Belvoir and Fairfax County in the spring of 1998, installation, county, state and federal officials became concerned that cankerworm problems in our area would increase. Monitoring of populations throughout the winter suggested potential problems in two areas of Fort Belvoir, and *Bacillus thuringiensis (B. t.)* was sprayed in those areas when the populations emerged in the spring of 1999.

Since then, the installation has not had another nuisance outbreak of cankerworms. One can monitor cankerworm populations by capturing the adult, wingless females with Tanglefoot^{R} applied to a band of tarpaper wrapped around susceptible oaks during winter months. If the females number greater than 90 per pair of trees monitored (trees selected should be within the same stand), then these results justify consideration of spraying *B. t.* following emergence.

4.7 Undesirable Vegetation and Microbial Organisms

a. **Weed Control:** Weed control, consisting of nonselective vegetative control, invasive weeds as defined by the Federal Noxious Weed Act (Public Law 93-629), Virginia Alien and Invasive Weeds as defined by the Virginia Department of Conservation and Recreation, and aquatic weed control, is conducted at Fort Belvoir. Control measures are implemented on an as-needed basis or, in certain cases, every spring, depending upon weather influences, work force, and budgetary constraints. Weed control is required to maintain fence lines, signposts, parking areas, building perimeters, control invasive species etc. Weeds along fence lines, on road shoulders, paved surfaces, etc., require control using appropriate herbicides. Some control of unwanted plants is done mechanically (mowing, weed eaters, etc.).

b. **Disease:** If disease is found in trees or ornamentals, the Pest Control Technicians work very closely with Roads and Grounds staff to develop a curative plan. The USDA and local state universities provide literature and assistance when needed. Most problems are controlled soon after discovery in order to avoid serious problems.

c. **Aquatic Weed Control:** Fort Belvoir has a few ponds that may occasionally require mechanical or chemical spot treatments to control aquatic weeds. Aquatic weed control is designed to provide for maximum efficient utilization of available water resources, consistent with the installation mission and wetland protection procedures. The program intent is to increase the potential recreational use of ponds and streams and to protect aquatic resources.

4.8 Other Pest Management Requirements

Pest Control Technicians are responsible for carcass removal. In addition, the Pest Control Technicians provide services for odor control in buildings and other structures on the installation. Odors may arise from such situations as dead animals in walls, crawl spaces, decaying vegetation, or molds and fungi or from other sources.

4.9 Quarantine Pests

When required, the local USDA inspector checks incoming materials for the presence of eggs, larvae, or adult pests. Retrograde cargo may be encountered infrequently and will be inspected for pests on an individual basis. Housing inspectors receive training so that they will be aware of concerns with in-bound household goods shipments.

4.10 West Nile Virus

FB-DPW ENRD, Preventive Medicine, Veterinarian Services, and the Base Operations (BASOPS) Contractor are continuing concerted efforts to reduce the threat of the West Nile Virus to Fort Belvoir residents. This includes ongoing surveys and monitoring of high-risk areas, treatment of breeding sites with larvicides, and reducing potential breeding pools. Mosquitoes are trapped and collected from several locations on the installation. Preventive Medicine personnel sort the mosquitoes by species and sex. There have been infected mosquitoes found in the State of Virginia, Fairfax County and most recently on Fort Belvoir. Birds are the first carriers of the West Nile (encephalitis) Virus. Dead birds should not be handled with bare hands. Housing residents are to call Family Housing Management Work Order Desk at 703-619-3880. All others call the BASOPS Contractor at 703-806-3109. Several species of birds are susceptible to the virus. Crows have been most prominent, due in part to their size and numbers. Individuals living off Fort Belvoir in Fairfax County should contact the Fairfax County Health Department at 703-246-2300.

a. Fort Belvoir will continue with a comprehensive, cooperative program to reduce the risk of West Nile Virus. The main objectives are to keep residents informed of current actions and precautions that should be taken, and to continue implementing best IPM practices to control mosquito populations and enhance the safety of Fort Belvoir's residents and employees.

b. Some mosquito breeding may take place on the installation in artificial containers and small temporary pools of water. Most of the mosquitoes that bite installation personnel come from these sources. Several viruses may be potentially transmitted by mosquito species listed in the most recent USACHPPM Pest Profile, Report #16-07-4673-96.

c. Adult mosquitoes rarely require fogging for control. When required, residual insecticides are applied to vegetative mosquito resting areas. Coordination for mosquito control on lakes and ponds is discussed in Section 9, this plan.

5.0 INTEGRATED PEST MANAGEMENT (IPM)

IPM is the use of multiple techniques to prevent or suppress pests in a given situation. Although IPM emphasizes the use of non-chemical strategies, chemical control may be an option used in conjunction with other methods. IPM strategies depend on surveillance to establish the need for control and to monitor the effectiveness of management efforts.

5.1 IPM Approach

There are four basic methods of control used in the IPM approach. These methods, described below, are incorporated into each of the IPM Outlines. While any one of these methods may solve a pest problem, often several methods are used concurrently, particularly if long-term control is needed. For example, screens may be used to prevent mosquitoes from entering buildings, breeding areas may be filled in or drained to eliminate larval habitat, and pesticides may be used to kill adult mosquitoes. Screens will protect people inside, but do little to keep people from being bitten outdoors. Larval control may eliminate mosquito breeding on the installation, but may not prevent adult insects from flying onto the installation from surrounding areas. Chemicals may kill most of the flying mosquitoes, but may miss others. Although chemical control is an integral part of IPM, nonchemical control is stressed. Chemical control is usually a temporary measure and, in the end, more expensive. Nonchemical control, which may initially be more expensive than chemicals, will usually be more cost effective in the end. Nonchemical controls also have the added advantage of being nontoxic, thereby reducing the potential risk to human health and the environment.

a. **Legal Mandate:** Federal Agencies are mandated by Section 136 et seq. of Title 7, United States Code, FIFRA, 1976 as amended to use IPM. IPM is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks. The Army is committed to IPM at its facilities and installations as the best approach to control pests and reduce pesticide reliance and resistance.

b. **Mechanical and Physical Control:** This type of control alters the environment in which a pest lives (trapping, removal and exclusion). Examples include: harborage elimination through caulking or filling voids, screening, mechanical traps or glue boards, and nets and other barriers to prevent entry into buildings.

c. **Cultural Control:** Strategies in this method involve manipulating environmental conditions to suppress or eliminate pests. For example, spreading manure from stables onto fields to dry prevents fly breeding. Elimination of food and water for pests through good sanitary practices may prevent pest populations from becoming established or from increasing beyond a certain size.

d. **Biological Control:** In this control strategy, predators, parasites or disease organisms are used to control pest 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.

e. **Chemical Control:** Pesticides kill living organisms, whether they are plants or animals. At one time, chemicals were considered the most effective control available, but pest resistance rendered many pesticides ineffective. In recent years, the trend has

been to use pesticides that 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. Since 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 quite costly when compared with nonchemical control methods.

5.2 IPM Outlines

IPM Outlines may be found in the IPMC's office at FB-DPW ENRD. Each major pest or category of similar pests is addressed, by site, in separate outlines. New outlines will be added as new pests or sites are encountered that require surveillance or control.

5.3 Annual Workload for Surveillance, Prevention, and Control

The number of person-hours expended for surveillance, prevention, and control of pests on Fort Belvoir is maintained by the IPMC.

6.0 HEALTH AND SAFETY

6.1 Medical Surveillance of Pest Management Personnel

Medical monitoring is required for all Fort Belvoir personnel involved in pest control operations as Quality Assurance Evaluators (QAEs). Medical surveillance is conducted by the Fort Belvoir MEDDAC/Preventive Medicine- Occupational Health Section to ensure that personnel are fit for the job and that there are no physical conditions that would make them especially vulnerable to potential pesticide health hazards. Contract Pest Control Technicians who apply pesticides on the installation are included in a medical surveillance program by the Contractor. This program is in compliance with current Occupational Safety and Health Administration/EPA standards.

a. Some common symptoms produced by cholinesterase-inhibiting substances are listed in Table 2.

Table 2. Symptoms Caused by Cholinesterase Inhibiting Substances

Mild Poisoning	Moderate Poisoning	Severe Poisoning
Anorexia	Nausea	Diarrhea
Dizziness	Salivation	Pinpoint, non-reactive pupils
Weakness		Lacrimation
Respiratory difficulty		

Anxiety	Abdominal cramps	Pulmonary edema
Tremors of tongue and eyelids		Vomiting
Cyanosis		
Miosis	Perspiration	Loss of sphincter control
Impairment of visual acuity	Slow pulse	Convulsions
	Muscular tremors	Coma
	Heart block	

b. Personnel who handle or otherwise come into contact with wild animals on the installation receive rabies prophylaxis. This includes Military Police, Wildlife Biologists and Pest Control Technicians. Special gloves and equipment designed for handling wild animals will be procured and used by all personnel involved in such operations.

c. All government employees whose duties place them in close personal contact with pesticides through quality assurance evaluations or contracting officer representative responsibilities are monitored by the Occupational Health Clinic.

6.2 Hazard Communication

a. All Fort Belvoir personnel shall be provided access to all appropriate health and safety information pertaining to pesticide use at the installation.

b. The following items will be made available for use and review within DPW:

(1) Fort Belvoir IPM Plan

(2) Copy of Fort Belvoir Hazard Communication Program

(3) Labels for all pesticides currently used on the installation

(4) Copies of all pesticide Material Safety Data Sheets (MSDS)

c. The IPMC will maintain a complete set of the above information for reference by all pest control personnel. Pest control personnel will also be provided with updated copies of the following:

(1) Technical Information Bulletins from Armed Forces Pest Management Board.

(2) Pest Management Bulletins from USACHPPM.

(3) Other relevant technical guidance documents as published by USACHPPM.

d. Installation personnel with pest management responsibilities are given hazard communication training, which includes a review of hazardous materials in his/her workplace. Following initial hazard communication classes, additional training is given to new employees or when new hazardous materials are introduced into the workplace. When trained, Form SF 186 will be filed in each employee's personnel records and will be retained for 30 years. SF 186 copies will be procured and added to this IPM Plan.

e. Current MSDS for all pesticides and other toxic substances used in the pest management program are to be maintained in the Pest Control Office, Building 1496. MSDS are to be accessible to employees at all times.

f. Additionally, MSDS are kept in each facility where pesticides are stored or handled. Copies of MSDS are also kept on each pest control vehicle for pesticides used that day. The IPMC, Fire Department, environmental management, and installation safety officers also maintain complete MSDS files.

6.3 Respiratory Protection

a. The Pest Control Contractor is responsible for ensuring contract personnel are enrolled in a respiratory protection program.

b. Facility safety officers are responsible for developing programs to ensure personal protective equipment is available and correctly used in accordance with AR 385-10. All pest control personnel must conform to all applicable post respiratory protection programs.

6.4 Personal Protective Equipment

Approved masks, respirators, chemical resistant gloves, and boots, and protective clothing (as specified by applicable laws, regulations and/or the pesticide/label) are provided to pesticide applicators by the Contractor, as applicable. Personal protective equipment, including respirators, gloves, eye protection and protective clothing are to be utilized by all pest control personnel engaged in handling pesticides in accordance with the requirements set forth in the FIFRA (40 CFR 162), Occupational Safety and Health Administration Standards (29 CFR 1910), DOD Instruction 4150.07, Army Regulation 200-1, and individual pesticide labels. Personal protective equipment is to be worn as necessary by all pest control personnel.

6.5 Work Place Monitoring

Annual occupational hazard surveys shall be performed by Fort Belvoir Preventive Medicine to evaluate occupational health hazards associated with pest control operations at Fort Belvoir for non-contractor specific areas. Fort Belvoir Public Health telephone number is (703) 805-0059/0063.

a. In addition, USACHPPM can provide periodic review of the installation pest management program. The purpose of USACHPPM surveys is to review the pest management program (emphasizing health related aspects) and to provide technical assistance on the adequacy, safety, effectiveness, and efficiency of the program.

b. All findings and recommendations provided by work place monitoring surveys shall be addressed and implemented by Fort Belvoir or the Contractor (as appropriate) in a prompt timely fashion.

6.6 Laundering Facilities

a. The Contractor is responsible for the laundering of protective clothing worn by Contract Pest Control Technicians.

b. Severely contaminated clothing is not laundered, but is considered a pesticide-related waste in accordance with 40 CFR 262.11. Clothing will be disposed of by the contractor in accordance with current Environmental Office requirements.

6.7 Emergency Decontamination Facilities

Emergency decontamination equipment, consisting of a shower and an eyewash fountain is located in the Pest Control Shop. All pest control personnel shall be instructed on the proper use of this equipment in the event of pesticide contact with skin or eyes. Decontamination procedures are conducted per guidance from installation medical personnel.

6.8 Fire Protection

a. Two outside Pesticide Storage Facilities, sited adjacent to Building 1496, contain all the pesticides stored by the Government Pest Control Contractor. The building area and land, approximately 20,000 square feet in size, is located within a secure area. Each facility is equipped with spill containment, double locking doors that are 4-hour fire-rated, fire protection, fire alarms, and heating and air conditioning. A current inventory is posted outside of each facility. Pesticides are not stored outside under any circumstances. The probability of a fire at this site is low. The golf course stores pesticides and probability of a fire at that location is also low.

The pre-fire plan includes a layout of the pest control storage facility. In addition, pesticide inventories are sent to the Fire Department every six months. The Fort Belvoir Fire Chief will determine which fire control efforts to employ depending on the size and type of fire at the time a fire call is reported. Maps and other information relating to fire control can be found on file in the IPMC's office and the Fire Department.

b. Minor amounts of pesticides are also provided for sale or distribution at the Commissary and Post Exchange.

6.9 Pest Control Vehicles

All pest control vehicles are contractor owned. Pest control vehicles are only used for pest control purposes. They are appropriately placarded and labeled "Contaminated with Pesticides" in accordance with Federal law. Care is taken to secure pesticides to prevent damage to the containers and spillage of the chemicals. At no time are pesticides left unsecured in the vehicles when unattended. The vehicle will have lockable cab and lockable storage compartments. Pesticides or contaminated equipment are not placed in the cabs of the vehicles. A copy of the pesticide label and MSDS are on-hand for each pesticide carried in the vehicle. Portable eye lavage and spill kits are carried in each pest control vehicle when in use.

7.0 ENVIRONMENTAL CONSIDERATIONS

The Fort Belvoir Pest Management Program is totally committed to conducting operations in a safe manner. Environmental stewardship emphasizes the importance of considering the environmental implications in the application of integrated pest management efforts.

7.1 Protection of the Public

Precautions are taken during pesticide application to protect the public, on and off the installation. Pesticides are not applied outdoors when the wind speed exceeds five miles per hour. Whenever pesticides are applied outdoors, care is taken to make sure that any spray drift is kept away from individuals, including the applicator. Outdoor applications also take precautions to ensure there is no possible contamination to potable water and the drinking water supply. Individuals wearing the proper personal protective clothing and equipment indoors accomplish pesticide application. At no time are personnel permitted in a treatment area during pesticide application unless they have met the medical monitoring standards and are appropriately protected. Pesticide applications also take into account operations near personnel who have been included in the local sensitive individual list. When appropriate, public notification of pest management efforts is conducted through the appropriate media.

7.2 Sensitive Areas

a. Pest control personnel should be aware of the potential impacts associated with pesticide use within sensitive areas at Fort Belvoir. A sensitive area is any place where pesticide use could cause great harm if not used with special care and caution.

Examples of sensitive areas include barracks, residences, bivouac areas, training areas, campsites, recreational areas, dining facilities, medical clinics, playgrounds, sensitive crops, and all surface water sources (including wetlands). Areas where beekeepers maintain hives are also considered sensitive. Extreme caution must be employed wherever and whenever the potential for human exposure to pesticides exists.

b. Special care is given when pesticides are applied in the child development centers (CDCs) , in patient areas of the hospital, or in family quarters where newborn infants are present. Pesticide label instructions and guidance provided in the AFPMB TG No. 20, Pest Management Operations in Medical Treatment Facilities, are followed.

7.3 Child Development Centers (CDCs)

No pesticides are to be used in or around the Fort Belvoir CDCs except under the following stipulations and conditions.

a. In the event the CDC develops a pest control problem that cannot be controlled by any other IPM non-chemical control method, Preventive Medicine and the IPMC will identify the pest and approve a specific chemical application.

b. No herbicides shall be applied within 100 feet of CDC facilities.

c. Only pesticides registered by the Commonwealth of Virginia and approved by AEC may be used.

d. Only the least toxic material may be used, with emphasis on baits.

e. Notification procedures will be used in accordance with Best Management Practices. At least 72 hours prior to pesticide application, postings are placed in a centralized location and notice sign must be at least 8.5" by 11". Notice will provide locations to be treated, time/date of treatment, re-entry times, chemical to be applied, and precautions to be taken, and contact information. Notice will remain posted for 48 hours. Parents will receive notification information packet during the registration process and must complete a request to be notified or not to be notified during the enrollment process. Fort Belvoir pest control personnel shall coordinate with CDC staff prior to any application to ensure notification and adherence to this plan. If, in the event of a pest control emergency, and the use of pesticides are required, notification must be made by phone to those requesting to be notified.

f. A current copy of approved pesticide labels and MSDS will be kept at the CDC office.

g. If required, pesticides are to be applied during non-operational hours only. A minimum of seven hours re-entry time for students must be adhered to.

h. No personal repellants shall be applied by CDC staff at any time.

i. The following classes of chemicals are exempt from notification:

(1) Disinfectants and anti-microbials.

(2) Manufactured self contained baits and gel type baits in inaccessible locations (not accessible to children).

(3) The use of soap and water mixtures for the removal of stinging insects and nests.

7.4 Endangered/Protected Species and Critical Habitats

a. In December 1988, DOD and the Nature Conservancy (TNC) entered into a Cooperative Agreement for the purpose of identifying, documenting, and maintaining the biological diversity of DOD installations. In entering into this agreement, it was DOD's goal to obtain technical assistance for improving the management of its natural resources, and to gain access to the nationwide network of compatible data to be used to assess the relative significance of each element of biological diversity found on DOD land. The Division of National Heritage (DNH) (acting on behalf of the TNC), the US Army Corp of Engineers, Mobile District; and the Fort Belvoir Military Reservation signed the Cooperative Agreement in 1991. This agreement established the framework under which a comprehensive inventory of the biological diversity of Fort Belvoir was undertaken. DNH began work on the inventory during the winter 1991-1992, and completed field surveys in November of 1993. Impact Areas were not surveyed due to the hazards associated with unexploded ordinance. A detailed report on the existing rare, threatened and endangered species found at Fort Belvoir was completed and submitted in May 1994.

b. During the late 1990's extensive Planning Level Surveys were undertaken to support development of Fort Belvoir's INRMP. These surveys documented numerous rare species and sensitive habitats.

c. Fort Belvoir's unique diversity of habitats supports a substantial population of State and Federally listed endangered, threatened and rare species. The rare species surveys identified 17 rare ecological community types, and 63 rare, threatened or endangered (state-or federally listed) plant and animal species on Fort Belvoir. Twelve conservation areas meriting enhanced protection were identified and described. Of the 12 areas identified for special protection as conservation sites, nine are located at the western and southern portions of the installation. Three of these areas are found in the northern third of the installation. Detailed information on rare habitats and species is available at FB-DPW ENRD and in the INRMP, which is posted on the Fort Belvoir website.

d. The bald eagle, (*Haliaeetus leucocephalus*), is protected under the Federal Bald and Golden Eagle Protection Act, and is state-listed as threatened. Bald eagles have nested on Fort Belvoir since 1990. Multiple active nest sites occur throughout the Main Post, and historic nest sites are recorded on FBNA. The Fort Belvoir shoreline has been officially designated as part of the Mason Neck Bald Eagle Concentration Area due to the extensive year-round presence of bald eagles. Because of the major presence of bald eagles on Fort Belvoir, all surface waters are identified as sensitive areas by this plan. All outdoor pesticide applications in and around bald eagle habitat areas, such as described above, must receive approval prior to use from the IPMC. All work to be scheduled or accomplished in these areas must be coordinated with the Natural Resources Manager at 703-806-0049.

e. The small whorled pogonia (*Isotria medeoloides*) is a member of the orchid family, and one of the rarest plant species found in North America. This plant is currently protected as a threatened plant species under the Federal Endangered Species Act of 1973. A stem was found and identified at FBNA in 2006. Other potential habitat has been observed. The small whorled pogonia prefers relatively mature woodlands free of a dense under story. The plant is most often found in well-drained uplands. The habitat and surrounding environment of the small whorled pogonia colonies are recognized as critically sensitive areas by this plan. All outdoor pesticide applications in and around habitat areas, such as described above, must receive approval prior to use from the IPMC. All work to be scheduled or accomplished in these areas must be coordinated with the Natural Resources Manager at 703-806-0049.

f. The wood turtle, a state-listed threatened species, occurs in several locations, mostly riparian habitat, within Fort Belvoir. Outdoor pesticide applications in known wood turtle areas must also be coordinated with the IPMC. All work to be scheduled accomplished in these areas must be coordinated with the Natural Resources Manager at 703-806-0049.

g. The Northern Long Eared Bat (NLEB) was listed by the U.S. Fish and Wildlife Service as a Threatened Species in May 2015. Fort Belvoir will follow the guidelines as stated in the IMCOM Final NLEB Programmatic Conference dated 4 May 2015 and IMCOM Northern Long Eared Bat Concurrence Letter dated 4 May 2015 and included as L-1 and M-1 respectively in the Annexes to this plan.

h. Actions that are potentially dangerous to endangered and threatened species are evaluated by the IPMC and must be approved by the Natural Resources Manager at 703-806-0049 and AEC personnel.

7.5 Environmental Documentation

An environmental assessment (EA) has been drafted for the Fort Belvoir IPM Plan. The Fort Belvoir INRMP and Real Property Master Plan EAs address the IPM Plan.

The new IPMP EA will specifically address IPM actions, strategies, and principles implemented under the approved IPM Plan. The IPMC will ensure that this IPM Plan is referenced in the EA as documentation of pesticide use.

7.6 Pesticide Spills and Remediation

A pesticide spill cleanup kit is maintained in the pesticide storage area of Building 1495. Guidance from Armed Forces Pest Management Board Technical Guide (AFPMB TG) No 15, Pesticide Spill Prevention and Management and installation policies is followed for pesticide spill cleanup, decontamination, disposal, notification procedures, and components of spill kits. A spill clean-up kit is kept on each pest control vehicle. Additional information on pesticide spills can be found in AFPMB TG No. 15, this document, and in the installation spill plan located at the pest control facility. All reportable pesticide spills are reported to the installation hazardous waste manager.

7.7 Pollution Control/Abatement Projects

There are currently no pesticide pollution control or abatement projects on Fort Belvoir.

7.8 Pollution Prevention (P2)

This pest management program complies with the applicable sections of Executive Order (EO) 13148 of April 21, 2000, Greening the Government through Leadership in Environmental Management. NOTE: EO 13148 revoked EO 12856. See http://www.ofee.gov/eo/eo13423_main.aspfor details.

7.9 Prohibited Activities

a. At no time will a pesticide be used in any manner inconsistent with its label.

b. No pesticide will be used whose registration has been suspended or cancelled by the EPA or the State of Virginia.

c. Herbicides will not be used to control weeds in areas where children play.

d. Pesticides will not be used in CDC facilities without the prior approval of AEC Senior Pest Management Consultant.

e. Pesticide misuse – which includes use inconsistent with the label – is a violation of Federal Law. In accordance with DOD policy (see DOD 4150.7 – P), Fort Belvoir personnel will record and report any instances of pesticide misuse and falsification of records by contractors to the Commonwealth of Virginia. Furthermore,

Fort Belvoir personnel will cooperate with Virginia regulators and the EPA in any subsequent investigation or actions.

NOTE: This is a sensitive issue with many States. They are concerned that a contractor would try to hide behind sovereign immunity (which was never waived for FIFRA).

8.0 ADMINISTRATION

8.1 Contracts

a. Fort Belvoir pest management services are currently contracted out with the exception of the Golf Course. The IPMC reviews all pest management contracts before issuance as directed by the Fort Belvoir Integrated Pest Management Policy. The scope and applicability for the contractor is provided in each contract. Termite treatments are included in the specifications of all new contracts, hence treatments in accordance with applicable product recommendations and labels are the sole responsibility of the general contractor. Fort Belvoir retains the right to and does inspect and review all facets of each pretreatment operation. The Quality Assurance Evaluator accomplishes this. Contract review is conducted on the interval provided in the contract; completion of contract review is documented by the IPMC.

b. Performance work statements (PWS) and instructions are maintained on file with the IPMC. The PWS follows accepted IPM guidance of emphasizing the need to conduct surveillance first and use pesticide treatment as a last resort. Currently installation services are provided under Commercial Activities contracts. Copies of all contract cover pages will be kept on file with IPMC.

8.2 Job Orders

a. The Contract Pest Control Technicians perform pest surveillance and control under Standing Service Orders (SOO's) or Contract Line Item (CLIN's). The SOO's and CLIN's cover work performed in 1) family housing units (exterior only), 2) food handling buildings, 3) all other buildings and outside facilities on Fort Belvoir.

b. Work requests for buildings other than those mentioned above are performed under a separate SOO or CLIN that includes all buildings on the installation.

c. Outside of routine inspection and surveillance, building occupants who encounter a pest management problem beyond their ability to control are to contact FB-DPW. Housing residents are to contact FBRC Family Housing Work Order Desk at 703-619-3880 for interior pest control assistance and FB-DPW for exterior pests except termites. An assessment will be conducted and appropriate action taken.

8.3 Inter-service Support Agreements

Fort Belvoir will provide pest management support to tenant activities as stipulated in applicable Intra-service and Inter-service support agreements (ISSAs).

8.4 Agricultural Out-leases

Presently Fort Belvoir has no agricultural out-leases. If in the future agricultural out-leases are developed, the following procedure will be followed:

a. Prior to any agricultural chemical application to an out-leased property, the lessee shall notify the IPMC of the intent to perform chemical pest control. The notification shall be in writing and contain the following information:

(1) Proposed date of application.

(2) Pesticide to be applied (including label) and rate.

(3) Application method (equipment to be used).

(4) Application site.

(5) Pest to be controlled.

b. The IPMC shall notify the pest controller and the environmental coordinator of the lessee's intent. These two offices, along with the IPMC, will review the lessee's control plan to determine adequacy with this pest control plan, as well as DOD, State, and Federal regulations. The lessee will be permitted to perform the planned pest control activity only after review and approval of the lessee's control plan by the above referenced offices. Any recommendations presented by Fort Belvoir shall be incorporated as part of the lessee control plan, otherwise, permission for application shall be denied.

8.5 Resources (Current and Proposed)

a. **Staffing:** The following personnel are involved with pest management on Fort Belvoir. The below list includes activities with both full-time and part-time employees. Copies of Pesticide Applicator Certification are provided for those personnel with direct oversight of the program and for those who apply pesticides as a principal responsibility of their position.

- DPW – Installation Integrated Pest Management Coordinator (IPMC)
- Quality Assurance Evaluator

- Contracted pest management technicians (full-time, State certified)
- Public Health Specialists (full-time, DOD certified)
- Veterinary Food Inspectors/Animal Care Technicians (full- time)
- Golf Course (Government, full time, DOD certified)

b. **Materials and Equipment:** The Contractor furnishes all materials and equipment. Pesticides and pesticide application equipment are maintained on the installation by the North Post Golf Course and the in-house Government Contractor. Pesticides and IPM products are ordered as required to maintain Fort Belvoir facilities in accordance with the current IPM Plan. Pesticides, which are required for use during a specific time of year (e.g., herbicides applied in the spring when weeds are emerging), are ordered in a timely manner to ensure effective application. The inventory of pesticides, provided as a Pesticide Usage Proposal as approved by AEC, lists the pesticides on hand at Fort Belvoir. This inventory is updated as changes occur.

c. **Main Post Pest Control Facility (Mixing and Storage Sites)**

(1) General Description: The Pest Control Shop, Building 1496, contains an office area, a mixing and formulation room, and an equipment storage room. All pesticides are stored in two pesticide storage buildings that were manufactured for pesticide storage and which meet all current Federal, State and DOD specifications for pesticide storage facilities. The pesticide storage facilities are located adjacent to Building 1496. It is located in a secure, fenced compound of approximately 20,000 square feet. The building is constructed of cinder block walls, concrete floors, and an asphalt over metal roof. The lavatory and storage areas have a drop ceiling. The facility provides personnel with a lavatory, locker room, shower, and laundry washing machine and dryer. The mixing facility is plumbed in a manner that precludes the possibility of a pesticide from entering the sanitary sewer system. A drawing on the facility layout is included in the pre-fire plan. All precautions will be taken to prevent spilling pesticides. If possible, all pesticides should be mixed at the mixing area.

(2) Mixing, Formulations, and Spill Containment: Pesticides are mixed in a well-ventilated area in Building 1496 on Fort Belvoir. The mixing/formulation area is a 320 square foot (approx.) room and is adjacent to the storage and treatment rooms. All mixing, formulating, loading of backpack sprayers, foggers, and cleaning of all small equipment take place in this room. The room is equipped with a hardwired and continuously active ventilation system. The concrete floor has been sealed and is sloped to a centrally located floor drain. The supporting Industrial Hygienist from Fort Belvoir performs extensive air quality testing (on an annual basis) to ensure that the mixing area has the proper ventilation system. There is a backflow prevention device on every fill hose used in the building.

(3) Equipment Storage Rooms: All pesticide equipment used by the Government Pest Control Contractor is stored in Building 1496. Plumbed eye lavage and deluge showers are provided within the building. This facility conforms to Army and Federal standards. A floor plan for this facility is located in IPMC's office. There is no

general fire suppression system in the building. The building is equipped with fire extinguishers in the equipment storage and mixing rooms. The equipment storage room is equipped with an active ventilation system. The system is hardwired by a switch located inside the door leading from the mixing room into the office area. There are two floor drains in the storage area, one located centrally in each of the "rooms." These drains have been plugged with pipes and screw caps. The concrete floor is recessed by one-half foot, and is bermed, grouted and sealed. The floor is sloped toward each of the plugged drains, effectively providing about 1,300 gallon capacity containment.

(4) Spill Equipment: A pesticide spill kit is maintained in the pesticide storage and mixing area. Safety equipment is also stored in the mixing area. An emergency eyewash and safety shower is located in this room near the outside door.

d. **North Post Golf Course Mixing and Storage Site**

(1) General Description: The Golf Course Pest Control Shop, Building 2990, contains an office area, maintenance bay and an equipment storage room. All pesticides are stored in two pesticide storage buildings that were manufactured for pesticide storage and meet all current Federal, State and DOD specifications for pesticide storage facilities. The pesticide storage facilities are located adjacent to Building 2990. They are located in a secure, fenced compound of approximately 90,000 square feet. The building is constructed of cinder block walls, concrete floors, and asphalt over metal roof. The facility provides personnel with a lavatory, locker room, shower, and laundry washing machine and dryer. A drawing on the facility layout is included in the pre-fire plan. All precautions are taken to prevent spilling pesticides. All pesticides are mixed at the mixing pad.

(2) Mixing, Formulation, and Spill Containment: Pesticides are mixed on a concrete mixing pad specifically designed and built for mixing of pesticides and cleaning of pesticide application equipment. The mixing/formulation area is a 320 square foot (approx.) bermed concrete pad, and is adjacent to the storage rooms. All mixing, formulating, and loading of powered hydraulic sprayers, and cleaning of all equipment take place in this area. The concrete floor has been sealed, and is sloped to a centrally located floor drain. There is a backflow prevention device on every fill hose used in the building.

(3) Equipment Storage Rooms: All pesticide equipment used by the Golf Course is stored in Building 2991. Plumbed eye lavage and deluge showers are provided within the building. This facility conforms to Army and Federal standards. A floor plan for this facility is located in IPMC's office. There is no general fire suppression system in the building. The building is equipped with fire extinguishers. The equipment storage room is equipped with an active ventilation system. A pesticide spill kit is maintained in the pesticide storage and mixing area. Safety equipment is also stored in the mixing area. An emergency eyewash and safety shower is located in this room near the outside door.

8.6 Reports and Records

a. Adequate records of all pest management operations performed by engineering personnel, Preventive Medicine, Veterinarians, contractors, agricultural lessee, (when present), are maintained on the installation by the IPMC. Pesticide use on other military installations by Fort Belvoir-based units will be reported to host installation IPMC. Field units on deployed status that are not operating on a US military installation will report pesticide use through command channels. Personal use of repellents (e.g., DEET and permethrin) does not need to be reported.

b. Forms for daily pesticide application and surveillance recording are maintained by all Contractors applying pesticides on Fort Belvoir. These forms provide a permanent historical record of pest management operations for each building, structure or outdoor site on the installation. The DD Form 1532-1 is maintained by the Pest Control Technician.

c. The monthly Pest Management Report (DD Form 1532 or approved alternate) is used to report all pest management operations on the installation. These reports are prepared by the Contractor and maintained by the IPMC.

d. The IPMC maintains the current inventory of stored pesticides. Copies of the inventory are sent to the Fire Department every six months.

e. Copies of termite inspection reports (DD Form 1070) are completed by the Contractor and forwarded to the IPMC as requested.

8.7 Training

a. Certification: Government (Fort Belvoir) employees who apply or oversee the application of pesticides are DOD-certified. Training and certification is conducted by the Army at Army Medical Department Center and School Fort Sam Houston, Texas. DOD Certification is also available from the Navy at the Disease Vector Ecology and Control Center, Jacksonville, Florida. Certified personnel are recertified every three years. Installation pest management personnel are certified in the appropriate EPA categories in order to perform Quality Assessment and Evaluation (QAE) or pest management operations (see Table 3). In accordance with DOD policy, all contract personnel who apply pesticides on Fort Belvoir will be certified as "commercial applicators" by the Commonwealth of Virginia Department of Agriculture and Consumer Services. Depending on application type, certification will be in one or more of the following Virginia categories: Ornamental Pest Control (3A), Turf (3B), Right of Way (6), General Pest Control (7A), Wood-Destroying Pest Control (7B), Vertebrate Pest Control (7D), and Public Health Pest Control (8). Contractors will provide photocopies of employee certification documents to the IPMC before performing services on the installation. Copies of training certificates are in maintained in IPMC's office.

Table 3. Fort Belvoir Certifications

There is one DOD certified applicator on Ft. Belvoir at this time.

Name	Activity/Function	EPA Categories*
Anthony Borros	NAF (Golf Course)	3,6

- Forest (EPA category 2)
- Ornamental and turf pest control (EPA category 3).
- Aquatic pest control (EPA category 5).
- Right-of-way pest control (EPA category 6).
- Industrial, institutional, structural and health-related pest control (EPA category 7).
- Public health pest control (EPA category 8).

b. Continuing Education and Training: Personnel who are certified in pesticide application attend local pest management classes, workshops, seminars, etc., in order to keep abreast of pest problems and pest management techniques that are unique to the area surrounding the installation. This is particularly true when dealing with vegetation control since many of the herbicide labels indicate that choices in strength and application technique should be based on local conditions. By attending local seminars, pest management personnel learn to solve problems on the installation by talking to people in the same geographic area that have solved similar problems in the past. The time and labor expended in this type of training is easily recouped through improved efficiency in pest control operations on the installation. Local pest management training consists of at least eight hours per year; which is in addition to any off-site re-certification training, such as the DOD course. Other personnel who deal directly with pest control operations, but who may not need to be certified, are also encouraged to attend local seminars to better understand the pest management needs of the installation.

8.8 Quality Assurance/Quality Control

a. The QAE for pest management contracts is no longer DOD certified and accredited in the EPA categories for which pest control work is performed on the installation. Training and certification will be obtained in FY16

b. A written quality assurance surveillance plan is used to evaluate all pest management contracts.

8.9 Design/Review of New Construction

Construction projects on Fort Belvoir are reviewed with pest prevention and control in mind. Engineering and medical personnel review the design of new buildings or other structures and conduct a pest evaluation in the constructed facility prior to completion of the project to ensure that insect and rodent entry points and potential harborage have been eliminated.

8.10 Five-Year Plan

Many administrative elements of the program such as recurring and projected requirements are addressed in the five-year review and update. This serves as a tool to identify these requirements and the timeframes for implementation. The five-year review should also include facility changes (e.g., new construction), program management, and resource requirements. Technical reviews and updates are made annually.

9.0 COORDINATION - DOD, OTHER FEDERAL, STATE AND LOCAL AGENCIES, AND PRIVATE PARTNERS

9.1 The Army Pest Management Program

The Army Pest Management Program is responsible for protecting personnel and material from illness and damage by pests, wherever in the world they may be. The program includes both medical and operational responsibilities. While these responsibilities do overlap, medical representatives focus on preventing and minimizing medical consequences of pests and pest management operations while the Assistant Chief of Staff for Installation Management (ACSIM) and AEC concentrate on safe, effective implementation of day-to-day pest management operations and environmental considerations of pest management operations.

9.2 Fort Belvoir Residential Communities (FBRC)

FBRC, under the Municipal Services Agreement with Fort Belvoir, is responsible for all indoor and structural pest control services in family housing units. This includes control measures within five feet of foundations for the purpose of structure associated pests, such as termites. The Government will provide all outdoor pest control services, including mosquito control. All FBRC operations must be in compliance with applicable Federal and State Statutes. As stated in the Community Development and Management Plan and the Memorandum from Headquarters, Department of the Army (DAIM-ZA, Subject: Installation Management of Pest Control Activities on FBRC

Properties, 3 October 2003), FBRC operations are not required to comply with AR 200-1 (Pest Management), the Fort Belvoir IPM Plan, or DOD Measures of Merit regarding pesticide applications and reductions.

9.3 The Army Environmental Command Pest Management Consultant

Provides technical oversight for the IPM Plan, and gives special attention to any pesticide application that: uses restricted-use pesticides; uses any pesticide that may significantly contaminate surface or ground water; includes 259 or more hectares (640 acres) in one pesticide application; may adversely affect endangered or other protected species or habitats; or, involves aerial application of pesticides.

9.4 The Installation IPM Coordinator and Preventive Medicine Personnel

Personnel maintain liaison at Fort Belvoir to determine the prevalence of disease vectors and other public health pests in the area surrounding the installation.

9.5 Directorate of Public Works Pest Control Contractor

The Contractor is responsible for all pest control on the installation and performing feral animal control. The contractor coordinates additional assistance for stray animal control throughout the installation with the Directorate of Emergency Services.

9.6 Control of Mosquito Larvae

Control of mosquito larvae on open water (e.g., during an encephalitis outbreak) is coordinated with the following agencies:

a. State of Virginia - Proposed actions are coordinated with health officials and environmental personnel.

b. Fairfax County Health and Environmental Offices - Proposed actions are coordinated with personnel in counties affected.

c. Bureau of Land Management and US Fish and Wildlife Service - These services are consulted whenever any proposed action may be detrimental to endangered species of birds.

d. Bureau of Reclamation - Responsible for managing the waterways in and around Fort Belvoir.

e. The Council of Governments will be involved with coordinating mosquito control efforts should an outbreak of West Nile Virus occur in or around Fort Belvoir.

9.7 Predator Control

Predator control, if required, must be done under permit from the Virginia Department of Game and Inland Fisheries and in coordination with FB-DPW-ENRD. After duty hours, disposition instructions will be obtained from the Fort Belvoir Military Police at 703-805-3105 following coordination with Installation Game Warden. Capture methods shall be limited to live traps or capture.

9.8. Military Construction Projects

Installation personnel coordinate with the Corps of Engineers to ensure that pesticide application, such as termite pretreatment for new construction, is properly performed and documented.

9.9 Private Partners

Private partners such as electrical, water, sewer companies must coordinate all pesticide applications with IPMC.

10.0 SALE AND DISTRIBUTION OF PESTICIDES

10.1 Family Housing

FBRC has sole responsibility for implementing and managing pest management in family housing areas with the exception of mosquito and wild animal control.

10.2 Self Service Supply Center (SSSC) and Unit Supply Operations

There is no SSSC on Fort Belvoir. Units are authorized to order the following repellents, and other pest management equipment as listed in AR 40-5, for Field Sanitation Team (FST) stockage, directly through supply channels. These repellents are for use on uniforms and skin, respectively.

a. Permanone, NSN: 6840-01-278-1336

b. 3M Insect Repellent, NSN: 6840-01-284-3982

10.3 Other Activities

a. AAFES: The pesticides sold in the Post Exchange Garden Center, (Building 1189) and AAFES Shoppettes are registered by the EPA for general use; restricted use products are not sold. Pesticide products are grouped into several separate categories: products applied to pets for ectoparasite control, repellents, household, and lawn and garden products. A spill clean-up kit is on hand in the immediate vicinity of the home and garden pesticide storage area. Store personnel are familiar with the use of the clean-up kit and with installation spill contingency procedures. Additional guidelines on pesticides in Exchanges can be found in DA Pamphlet 40-11, paragraph 4-7b(f)5.

b. The Fort Belvoir Commissary: The Commissary carries limited supplies of EPA-registered, general use pesticides in aerosol cans. A spill clean-up kit is on-hand. Store personnel are familiar with the use of the cleanup kit and with installation spill contingency procedures. Additional guidelines on pesticides in Commissaries can be found in DA Pamphlet 40-11, paragraph 4-7b(f)5 .

c. Veterinary Clinic: The Fort Belvoir Veterinary Treatment Facility provides support for military working dogs and domestic animals. Prescription items for ectoparasite control are available for sale to authorized personnel.

11.0 PEST MANAGEMENT SERVICES PROVIDED TO OTHER ACTIVITIES

11.1 Tenant Activities

Pest control services are provided to all tenant activities on Fort Belvoir. This includes: Dewitt Hospital and subordinate clinics, dental clinics, all Reserve Centers, Post Exchanges, Commissary, Defense Logistics Agency, Army Staff Management College, Army Material Command, Criminal Investigation Division, and others.

11.2 Agencies Located Off the Installation

There are no other agencies located off the installation that require pest management services.

12.0 REGULATED PESTS

12.1 Quarantine Pests

The USDA, when required, inspects incoming household goods and other cargo for the presence of gypsy moths. There are no other requirements for plant or animal quarantine on Fort Belvoir.

12.2 Noxious Weeds

The installation complies with all Federal and State noxious weed laws. When noxious weeds are encountered on the installation, care is taken to ensure that nearby non-target plants are not adversely affected. The Commonwealth of Virginia lists four noxious plant species. These are Johnson grass (*Sorghum halepense*), multiflora rose (*Rosa multiflora*), musk thistle (*Cardus nutans*), poison hemlock (*Conium maculatum L.*) and curl thistle (*Cardus* spp). State law requires these species be eradicated whenever they are found. Currently approved herbicides should be used in accordance with the directions and restrictions listed on the label.

13.0 PEST MANAGEMENT REFERENCES

13.1 Federal and State Laws and Mandates

These can be found in
http://www.law.cornell.edu/uscode/html/uscode07/usc_sup_01_7_10_6_20_II.html

a. Section 136 et seq. of Title 7, United States Code, FIFRA 1976," as amended.

b. Title 29, Code of Federal Regulations, 1996 revision, Section 1910, Occupational Safety and Health Standards.

c. Title 40, Code of Federal Regulations Parts 150-189, Pesticide Programs.

d. Sections 4321 to 4370a of Title 42, United States Code. "National Environmental Policy Act of 1969," as amended.

e. Executive Order 12856 of August 3, 1993. Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements.

f. Public Law 104-170, Food Quality Protection Act of 1996.

g. Rules and Regulations for Enforcement of Virginia Pesticide Law, 2VAC 20-51.

h. Virginia Noxious Weed Law, 1996.

i. The Virginia Pesticide Control Act, 1997.

13.2 Department of Defense Regulations, Directives, and Memorandums

a. DOD 4150.07, Pest Management Program, 30 May 2008.

b. DOD 4150.7-M, DOD Pest Management Training and Certification, April 1997.

c. DOD 4150.7-P, DOD Plan For Training and Certification of Pesticide Applicators, September 1996.

d. Memorandum of Agreement between the United States Department of Agriculture and the Department of Defense for Conduct of Forest Insect and Disease Suppression on Lands Administered by the U.S. Department of Defense, December 1990.

13.3 Army Regulations

a. AR 11-34, The Army Respiratory Protection Program, 15 February 1990.

b. AR 40-5, Preventive Medicine,25 May 2007.

c. AR 200-1, Environmental Protection and Enhancement,13 December 2007.

d. AR 385-10, The Army Safety Program, 29 February 2000.

e. DA PAM 40-11, Preventive Medicine, 20 October 2008

f. MIL-STD-903C, Sanitary Standards for Commissaries, 20 November 1986.

g. MIL-STD-904A, Guidelines for Detection, Evaluation and Prevention of Pest Infestation of Subsistence, 13 January 1984.

h. MIL-STD-909, Sanitation Standards for Food Storage Facilities, 31 August 1989.

13.4 U.S. Army Center for Health Promotion and Preventive Medicine Guides (http://chppm-www.apgea.army.mil/default.asp)

a. No. 103, Plague Surveillance Guide, September 1995..

b. No. 119, Collecting and Shipping Insects for Resistance Testing, August 1980.

c. No. 138, Guide to Commensal Rodent Control, December 1991.

d. No. 142, Managing Health Hazards Associated with Bird and Bat Excrement, December 1992.

13.5 Armed Forces Pest Management Board (http://www.afpmb.org)

This includes all applicable TG's, Pesticide lists and the complete revised "Military Pest Management Handbook".

a. No. 13, Ultra Low Volume Dispersal of Insecticides by Ground Equipment, December 1999.

b. No. 14, Protective Equipment of Pest Control Personnel, March 1992.

c. No. 15, Pesticide Spill Prevention Management, June 1992.

d. No. 16, Pesticide Fires: Prevention, Control, and Cleanup, June 1981.

e. No. 17, Military Handbook- Design of Pest Management Facilities, November 1991.

f. No. 18, Installation Pest Management Program Guide, March 2003.

g. No. 20, Pest Management Operations in Medical Treatment Facilities, November 2005.

h. No. 21, Pesticide Disposal Guide for Pest Control Shops, July 2002.

i. No. 24, Contingency Pest Management Pocket Guide, May 2008.

j. No. 26, Tick-Borne Diseases: Vector Surveillance and Control, February 2006.

k. No. 29, Integrated Pest Management in and Around Buildings, July 2003.

l. No. 31, Contingency Retrograde Washdowns: Cleaning and Inspection Procedures, November 2004.

m. No. 36, Personal Protection Techniques Against Insects and Other Arthropods of Military Significance, April 2002.

n. No. 37, Guidelines for Reducing Feral/Stray Cat Populations on Military Installations, January 1996.

o. No. 39, Guidelines for Preparing DOD Pest Control Contracts using IPM, February 1997.

p. No. 41, Protection from Rodent-Borne Diseases, April 1999.

DoDI 4150.07, May 29, 2008

5.4.20. Ensure that installations:

5.4.20.1. Annually update and coordinate the review and approval of their IPM plans; plan the funding for initial and 5-year revisions of IPM plans as necessary, consistent with the program elements in Enclosure 5 and Reference (q).

5.4.20.2. Implement IPM plans approved by designated pest management consultants using trained personnel and certified pesticide applicators, in accordance with the IPM plan written for each installation.

5.4.20.3. Designate in writing an IPM coordinator to oversee all aspects of the installation IPM plan, including in-house, formally contracted, and GPC-contracted operations; housing, engineer, and medical department operations; and pesticide applications for grounds operations, out-leasing, golf course operations, wood preservation, natural resources, forestry operations, self-help, and pesticide sales. Enclosure 4 contains details on the qualifications, training, and responsibilities of IPM coordinators.

5.4.20.4. Establish pest management self-help programs for non-privatized military housing when cost effective and when IPM monitoring justifies a requirement.

OSJA opinion:

I have reviewed the final Integrated Pest Management (IPMP) Plan for FY16. The IPMP has been revised to include information about the 2015 listing of the Northern Long-Eared Bat as a federally-threatened species.

I find no legal objection.

Susie Gillett
Environmental Law Attorney

U.S. Army Garrison Fort Belvoir
Integrated Wildland Fire Management Plan

Directorate of Public Works
Environmental and Natural Resources Division

April 2017

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Purpose and Authority

The Department of the Army Wildland Fire Policy Guidance, issued September 2002, requires installations with unimproved grounds that present a wildfire hazard and/or that utilize prescribed burns as a land management tool to develop and implement an Integrated Wildland Fire Management Plan that is compliant and integral with the Integrated Natural Resources Management Plan (INRMP), the installation's existing fire and emergency services program plan(s), and the Integrated Cultural Resources Management Plan (ICRMP). The policy guidance requires that the IWFMP be reviewed and updated annually and revised at least once every five years. The Integrated Wildland Fire Management Plan (IWFMP) provided herein lists the procedures and responsibilities for U.S. Army Garrison Fort Belvoir related to wildland fire management on the installation. This report is the first of its kind for the installation and provides information pertaining specifically to wildfire management, response and suppression. This IWFMP is a living document and, as a result, will require updates as additional information is gathered regarding wildland fire management on the installation.

Report Format

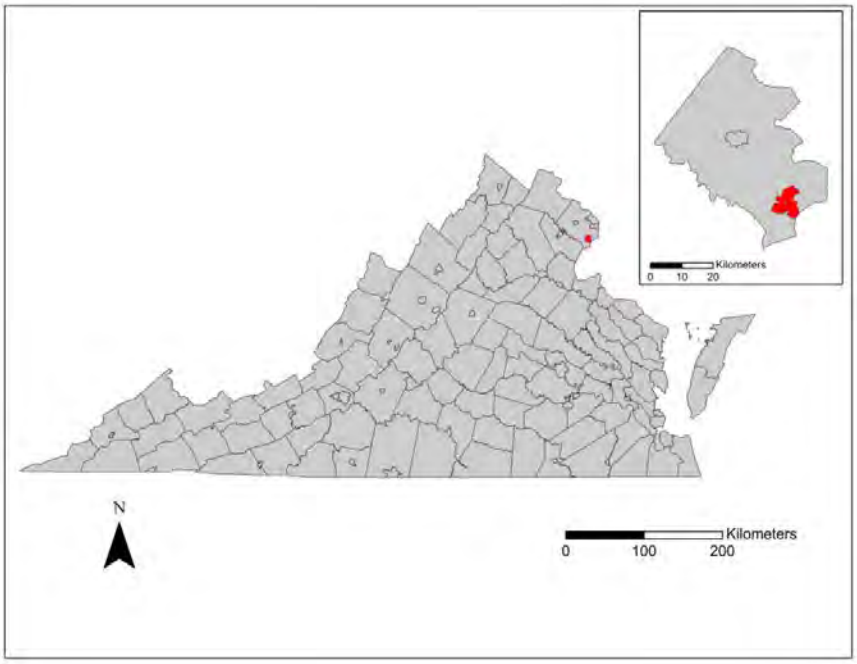
This report is formatted according to the Army Wildland Fire Policy Guidance (see Supplementary Materials). The IWFMP is an appendix to the INRMP, and contains all sections required by the Policy Guidance, Section 7. The format of this report follows the outline below:

1.0 Introduction
2.0 Goals and Objectives
3.0 Organizational Structure and Responsibilities
4.0 Interagency Cooperation and Mutual Aid Agreements
5.0 Smoke Management and Air Quality
6.0 Prescribed Burning
7.0 Firebreaks and Water (for both Emergency and Prescribed burning)
8.0 Safety and Emergency Operations
9.0 Risk Assessment/Decision Analysis Processes
10.0 Wildland Fire History
11.0 Natural and Cultural Resources Considerations
12.0 Mission Considerations
13.0 Wildland Fire/Urban Interface Considerations
14.0 Wildland Fuel Factors
15.0 Monitoring Requirements
16.0 Public Relations
17.0 Funding Requirements
18.0 Personnel Training and Certification Standards and Records
19.0 Environmental Assessment

1.0 Introduction

U.S. Army Garrison Fort Belvoir is an 8,489-acre military installation located in southeastern Fairfax County, Virginia, and situated approximately 18 miles southwest of Washington D.C. (Figure 1). The installation is abutted to Accotink Bay and the Potomac River on the southern end and is encompassed by metropolitan areas on the northern end. As a strategic sustaining base for America's Army in the National Capital Region, Fort Belvoir provides logistical, intelligence, and administrative support to a diverse group of more than 140 Army and Department of Defense (DoD) organizations.

Figure 1. Map depicting location of Fort Belvoir's main post in Virginia, with inset showing close-up view of the installation within Fairfax County, VA.



The installation has more than 12 miles of shoreline, three significant wetland areas (two of which are designated wildlife refuges), and extensive interior forested areas. Approximately 70% of Fort Belvoir is undeveloped. Fort Belvoir's surrounding local area (metropolitan Washington D.C. area) and regional area (Chesapeake Bay region) are both experiencing rapid conversions of undeveloped natural areas to other land uses. As a result, increased interest in wildfire risk, strategies for suppression, and concerns of air quality issues exists.

Fort Belvoir's mission is to provide exceptional facilities and services in support of resilience and mission readiness. Although much of Fort Belvoir's land area remains undeveloped, the mission requires significant administrative space and infrastructure. Belvoir's natural resources provide attractive settings for housing and administration facilities. They also contribute to the installation's Morale, Welfare, and Recreation Programs, which are aimed at improving the quality of life for military and civilian personnel who work and reside on post. Military training activities on Fort Belvoir are not land intensive. They primarily consist of land navigation, rescue, defensive tactics, mission essential task list skills, road march, float bridge, fixed-wing aircraft, helicopter transport and touch-and-go training.

Wildland fires at Fort Belvoir have not been a significant component of the installations history. To date, prescribed burning for forest management, to reduce woodland fuel loading, or to create/maintain selected habitats for plant/animal required habitats, have not been conducted. As military training activities on Fort Belvoir are not land intensive, and because pyrotechnics and incendiary devices are not employed as part of military training/testing, wildland fire frequency is low. Wildfires on the installation tend to be the result of lightning strikes or human negligence.

2.0 Goals and Objectives

The purpose of the IWFMP is to establish roles and responsibilities, procedures, and requirements for planning and controlling wildland fires on Fort Belvoir. Additionally, the requirements for prescribed burning are described. Health and safety are the priorities of this plan, as well as minimizing impacts to military training, natural and cultural resources, and property on and off the installation. The goal of this management plan is to influence consideration of various factors in the planning and implementation of wildfire suppression and to discuss necessary components for prescribed burning.

3.0 Organizational Structure and Responsibilities

The IWFMP applies to all personnel who work, live, and/or train at Fort Belvoir and are directly involved with wildland fire management on the installation. The following describes specific

roles and responsibilities ascribed to individual positions within the Fort Belvoir organizational structure:

*Garrison Commande*r. As stated in AR 420-1 (Supplementary Materials), the Garrison Commander is responsible for designating a Garrison Wildland Fire Program Manager and approving the IWFMP.

Director, Emergency Services. The Director of Emergency Services (DES) will review and implement the approved IWFMP. Additionally, the DES provides police support and dispatch services as needed for wildland fire events.

Director, Public Works. The Director of Public Works (DPW) will review and implement the approved IWFMP. The DPW should ensure that personnel associated with wildland fire are appropriately trained and equipped, and that the Emergency Management Plan is maintained.

Resource Management Officer. The primary responsibilities of the Resource Management Officer (RMO) are to provide guidance and oversight for the Fort Belvoir resource management program and ensure compliance with known laws, regulations, and guidelines. The RMO also represents the Resource Management Office at all emergency response meetings.

Chief, Fire and Emergency Services. The Chief of Fire and Emergency Services (Chief FES) will review and implement the approved IWFMP and provide Wildland Fire Program Management as the Wildfire Program Manager in all matters related to wildfire response and suppression activities and strategies. The Chief FES ensures all personnel involved with wildland fire meet certification and physical requirements as established by guiding policies, regulations and related standards as well as determine and maintain appropriate resourcing of wildland fire related equipment, personal protective equipment (PPE) and specialized vehicles. The Chief FES reports wildfire location and extent to the Installation Forester for burned acreage tracking and reporting purposes.

Chief, Environmental and Natural Resources Division. The Chief of Environmental and Natural Resources is responsible for reviewing and implementing the approved IWFMP and also ensuring appropriate application of all National Environmental Policy Act (NEPA) requirements in relation to wildland fire.

Installation Forester. The Installation Forester is to develop, review, update and implement the IWFMP. Additionally, the Installation forester tracks all wildland fire occurrences that occur on the installation in a geographic information system (GIS) for monitoring and assessing impacts to natural resources.

4.0 Interagency Cooperation and Mutual Aid Agreements

The mutual aid agreement for Fort Belvoir and surrounding areas is the Northern Virginia Emergency Services, Mutual Response Agreement (2009) (See Supplementary Materials). This agreement is referred to as the NOVA Agreement and serves as a Memorandum of Understanding (MOU) for Fort Belvoir and the following: City of Alexandria, City of Fairfax, City of Manassas, City of Manassas Park, County of Arlington, County of Fairfax, County of Fauquier, County of Loudoun, County of Prince William, County of Stafford, Fort Myer, Metropolitan Washington Airports Authority, and Marine Corps Base Quantico. This MOU creates a framework for a regional approach to the delivery of emergency services, using standardized response protocols and operational procedures that are unencumbered by the boundaries of respective political subdivisions.

To provide assistance off the installation, Fort Belvoir would provide brush units or engines. For utilization of externally-sourced equipment for wildfire, Fort Belvoir would request bulldozer support from the Virginia Department of Forestry. Additionally, informal, unwritten agreements exist between For Belvoir FES and 911th Engineers and Post Maintenance contractors requesting heavy equipment (personal communication, Fort Belvoir Battalion Chief, Stephen McDoniel).

5.0 Smoke Management and Air Quality

The production and effects of smoke are major factors in prescribed fire management. While fires can provide benefits to wildlife habitat, the discharge of air pollutants and potential public health effects resulting from smoke are well documented. These concerns are of particular importance on Fort Belvoir due to the presence of the installation within the Washington metropolitan area.

Fort Belvoir falls within the jurisdiction of the Virginia Department of Environmental Quality (VDEQ), Northern Regional Office. Additionally, Fort Belvoir is situated within the Virginia, Region 7 – National Capital Interstate - Air Quality Control Region. Fairfax County is considered within the Northern VA/DC/MD 2008 ozone NAAQS Nonattainment Area and the 1997 PM2.5 NAAQS Attainment/Maintenance Area. Fairfax County, as a result, must comply with Clean Air Act (CAA) conformity mandates. Concerns over smoke management and air quality standards preclude the likelihood of performing prescribed burning on Fort Belvoir.

6.0 Prescribed Burning

Fort Belvoir does not perform prescribed burning. Due to its location within the Washington metropolitan area, air quality and smoke management concerns, and unexploded ordnance (UXO) on the installation, prescribed burning is unlikely to be performed in the near future. However, if prescribed burning were to be implemented, a plan would be developed by a certified prescribed burn manager prior to any burning activity. Additionally, a smoke management plan, as part of the prescription plan, would be based on guidelines found in the Virginia Department of Forestry publication, “Voluntary Smoke Management Guidelines for Virginia,” and the U.S. Forest Service’s technical publication, “A Guide to Prescribed Fire in Southern Forests.”

7.0 Firebreaks and Water (for both Emergency and Prescribed burning)

A firebreak is defined as any natural or constructed discontinuity in a fuelbed used to segregate, stop, or control the spread of fire or to provide a control line from which to suppress fire, as per NWCG. For planning and implementation purposes firebreaks should be defined as plow lines,

hand lines, and trails created and maintained for fire management alone, whereas, the "firebreak system" referred to in this section of the plan includes all trails, roads, fuel breaks, creeks, etc. that may be used for fire management. Recommendations are provided by the Virginia Forestry Best Management Practices for Water Quality (2011) for firebreak installation, maintenance, and rehabilitation. The establishment and maintenance of a firebreak system is an effective prevention measure, because wildfire size and intensity are limited by systematic placement of fuel/fire breaks. Fort Belvoir GIS personnel have developed a fire break map depicting features that serve as firebreaks on the installation, including: paved and unpaved surfaces, streams and water body features, and trails. This map is provided in the Supplementary Materials.

8.0 Safety and Emergency Operations

Coordination in advance of a fire event is vital for appropriate fire response. Response criteria are dependent upon the severity, scope, and expected impact of the fire activity and applicable regulations for protecting the personnel, property, installation mission, and natural resource assets at the installation. The established response criteria are considered guidelines that may be modified based upon prevailing conditions and resource availability. The procedures create a repeatable standard intended to be integrated as a standard operating procedure that is understood by all stakeholders. Appropriate response level will be derived by observation of the environmental conditions and potential for spread or severe impact of the fire on Fort Belvoir or public assets or activities.

The National Incident Management System. Fort Belvoir is to implement procedures consistent with National Incident Management System (NIMS) and the incident command system (ICS) at all wildfire events. NIMS and the supporting ICS are the nation's primary venue for federal, state, local, tribal, and territorial governments to work together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. At Fort Belvoir, the ICS is to be utilized and incorporated in accordance with the Fort Belvoir Installation Equipment Management Program (IEMP) and coordinated with the Emergency Operations Center (EOC).

In the event a wildfire exceeds the capability of a crew to either control or contain, ICS will be implemented and the EOC stood up where the Garrison Commander or his designated

representative will be located in support of the Incident Commander (IC). Once ICS is implemented, the IC shall exercise complete authority to determine response measures and personnel utilization in response to wildfire activity. The Installation Forester or other natural resource personnel will provide technical, strategic, firefighter safety/accountability and resource knowledge support to the IC. The EOC will provide logistics and external resource acquisition, execution of mutual aid agreements or MOUs, as requested by the IC and coordination with state/federal resources as needed/requested by the IC.

Internal Fire Response Resources. Primary wildfire response is the responsibility of the Fort Belvoir DES Fire Department, with supplemental support from DPW and the Installation Forester, as needed. Identification of Fort Belvoir's firefighting assets available for wildfire response is provided in Supplementary Materials.

Unexploded Ordnance. Unexploded ordnance (UXO) has been found throughout Fort Belvoir, and UXO awareness training will be provided to all fire personnel. In order to ensure the safety of wildfire suppression personnel in emergency situations, during which emergency firebreaks must be dug, heavy equipment, such as plows, will not be used in the three specific areas shown on [UXO MAP TO BE PROVIDED] in Supplementary Materials. Instead, hand tools will be required for the construction of emergency firebreaks within those areas.

9.0 Risk Assessment/Decision Analysis Processes

Wildfire Assessment and Firefighter Safety. Once a wildfire has been reported and initial incident response has begun, observations by response personnel on the way to the incident will provide information on expected fire behavior, required suppression efforts, and firefighter safety. The ability to determine both the tangible and intangible assets to be protected is a difficult yet critical aspect of wildfire assessment, as is balancing the protection of such assets against current or expected fire weather and fuel conditions and available firefighting capability. The safety and security of fire response team members is of utmost importance when evaluating the situation.

Response personnel should consider the following factors in order to anticipate fire behavior, firefighter safety and resource protection:

1) Fuel and terrain
2) Weather conditions (on-site and forecast)
3) Smoke column characteristics
4) Observed fire behavior and rate of spread
5) Size of fire
6) Location of head of fire
7) Access routes
8) Resources and personnel at risk
9) Fire barriers (natural and constructed)
10) Potential water sources
11) Availability and capability of responding resources
12) Escape routes and safety zones

Suppression Strategy Decision Considerations. Suppression strategy decisions will be weighed according to the resources at risk in relation to the relative risk to fire suppression personnel. Endangering personnel to battle a wildfire that poses a limited threat to only the aesthetic quality of the installation must naturally receive a lower assessment for response than one that threatens both personnel and property (capital structures or equipment). All values-at-risk, including those less visible (e.g., sensitive natural resources), require consideration in planning protection strategies. The NWCG Incident Response Pocket Guide (see Supplementary Materials) provides information to consider in attack methodology decisions in relation to fire size, intensity, and estimated production rates of response resources.

Post Fire Suppression and Mop-up. Once a fire has been controlled, contained or confined, the IC will ensure that all smoldering embers, snags, stumps or other fuel sources will not cross firebreaks. Patrols of the perimeter of the fire activity will continue on a regular basis until assurance of complete control is achieved. Burning stumps, roots, or snags near the fireline will be extinguished with water or soil.

In circumstances where fireplow lines are used to establish wildfire control lines, a post-suppression evaluation will be conducted by the Installation Forester to determine the need for remediation efforts. Any fences or barriers that were damaged or moved for access will be replaced and any other remediable impacts due to suppression activities will be addressed. Direct impacts to waterways and wetlands will be mitigated immediately to reduce soil erosion impacts. The Virginia Forestry Best Management Practices for Water Quality (2011) will be utilized.

After-Action Review (AAR). Conducting an AAR following the conclusion of suppression efforts allows for feedback from firefighters, ICs and supporting resources to identify successes or gaps in suppression tactics, communications, safety, and logistics. The intent is to leverage the AAR information to improve future response scenarios through adaptive management principles. For most response situations, conducting an AAR is optional. However, an AAR will be implemented following any incident involving serious injury, significant equipment damage or destruction, where an installation fire escapes onto private property, or when the EOC was stood-up in support of the incident.

10.0 Wildland Fire History

Wildland fires at Fort Belvoir have not been a significant component of the installation's history. Fire suppression activities have minimized forest and grassland fires. To date, prescribed burns for forest management, to reduce woodland fuel loading, or to create/maintain selected habitats for plant/animal required habitats, have not been conducted. Wildland fires that have occurred in recent years are provided in the Supplementary Materials.

11.0 Natural and Cultural Resources Considerations

Natural Resources

Under federal law (e.g., Clean Water Act, Migratory Bird Treaty Act, Endangered Species Act), Fort Belvoir has a responsibility to take into account the effects of its actions on natural resources, even during emergency situations. The installation's significant natural resources,

including threatened and endangered plants and animals, are documented via the INRMP and GIS. Most of these resources are within forested areas of the installation and, therefore, could be impacted by wildland fire.

Approximately 70% of Fort Belvoir is undeveloped, supporting forested tracts, extensive wetlands, and regionally rare plant communities. Three on-post natural resource conservation areas (Accotink Bay Wildlife Refuge, Jackson Miles Abbott Wetland Refuge, and T-17 Refuge) are connected by the Fort Belvoir Wildlife Corridor to forested areas off-post. The Southwest Training Area is predominantly forested. Fort Belvoir's Natural Resources Management Program executes habitat conservation and enhancement projects (e.g., plantings, stream restorations, wildlife crossing structures under roads) throughout the installation. Some of these projects are undertaken as mitigation under NEPA or as Wetland Permit conditions, and, therefore, represent legally binding commitments. Fort Belvoir's Outdoor Recreation Program includes popular activities (e.g., hiking, hunting), which involve the installation's forested areas.

Fort Belvoir does not conduct prescribed burns, but, if a prescribed burn were to be planned, a review of natural resources databases would be required, and measures would have to be undertaken before and during the burn to reduce the risk to significant natural resources, to include but not limited to threatened and endangered species and rare plant communities. The Fort Belvoir Wetland Program Manager would acquire wetland permits in advance of any disturbance to wetlands. Fort Belvoir Biologists would complete Endangered Species Act Section 7 consultation and perform Migratory Bird Treaty Act bird surveys, as needed.

When fighting wildland fires, the effort will prioritize protection of installation assets and mission. However, it is recognized that the effort should avoid causing unnecessary impacts to significant natural resources. The use of tracked vehicles, or ground disturbing firefighting methods, should be avoided if possible in areas characterized as possessing protected natural resources. Such information will be provided by the Fort Belvoir Natural Resources Manager (NRM). The NRM should be contacted for guidance on natural resources protection, and to perform after-the-fact wetland permitting and/or emergency Endangered Species Act

consultation, as required. Post wildfire suppression, the NRM will assess the impact and determine what site stabilization and/or restoration is possible, or appropriate.

Cultural Resources

As a federal agency, Fort Belvoir has a responsibility under the National Historic Preservation Act (NHPA) to take into account the effects of its actions on cultural resources even during emergency situations. Fort Belvoir has more than 300 archeological sites, many of which are listed or eligible for listing in the National Register of Historic Places. The approximate locations of these sites are documented in the installation GIS database. Many of these sites are within forested areas of the installation, and could, therefore, be affected by a wildland fire.

Fort Belvoir does not conduct prescribed burns, but understands that, if a prescribed burn were to be planned, then a review of the archeological site database would be required, and measures would have to be undertaken before and during the burn to reduce the risk to archeological resources. The Fort Belvoir Cultural Resources Manager (CRM) (Directorate of Public Works) would complete the required NHPA Section 106 consultation with the State Historic Preservation Office, associated Native American tribes, and other applicable consulting parties in advance of any controlled burn.

When fighting wildland fires the effort will prioritize protection of assets. However, it is recognized that the effort should avoid causing unnecessary impacts to archeological sites. The use of tracked vehicles or ground disturbing firefighting methods should be avoided if possible in areas characterized as highly likely to contain archaeological resources, which will be developed and provided by the CRM. The CRM should be contacted for guidance on archeological site presence, and to do an After-the-Fact NHPA Section 106 consultation in accordance with 36 CFR Part 800 and the Fort Belvoir Integrated Cultural Resources Management Plan, Standard Operating Procedure 7: Emergency Procedures for Unanticipated Archaeological Discoveries. In instances where a wildland fire disrupted an archeological site, the Cultural Resources Manager will assess the impact and determine if site stabilization/restoration is possible, or appropriate.

12.0 Mission Considerations

Fort Belvoir's mission is to operate and maintain the installation; provide quality installation support and services to its customers; and to plan, maintain, and execute mobilization readiness, military operations, and contingency missions. Due to the proximity of the installation to metropolitan areas, wildfire suppression has been the priority, with little consideration given to prescribed burning. As Fort Belvoir does not perform live-fire training, prescribed fires to maintain fuel loads on the installation are not necessary. However, evaluation of existing and needed firebreaks to control wildfires is required to ensure safety to personnel and infrastructure on and off the installation.

13.0 Wildland Fire/Urban Interface Considerations

Wildland fires can pose significant threats to urban areas within and surrounding Fort Belvoir. For consideration of wildland fire/urban interfaces, forested areas adjacent to urban landscapes should be identified, quantified and mapped in order to prioritize wildfire risks. Identification of areas with high wildland fire risks (i.e., high fuel loadings) and the response time necessary to provide manpower and equipment should be considered. Future management efforts should be formulated to reduce fuel loadings in areas identified as high risk, as well as determine if access limitations are present. Addressing concerns of fuel loading and response protocols in high-risk areas of wildland fire and urban interfaces can greatly reduce wildland fire risks on the installation and ensure that thorough, proactive measures for protection of human life and infrastructure are taken.

Fuel Models and Wildland Fuel Factors

Anderson (1982) identified 13 Fire Behavior Prediction System fuel models within 4 groups (Grass, Shrub, Timber, and Slash) that are used to describe fuel complexes. These fuel complexes can be utilized to inform fire behavior predictions and modeling. Fort Belvoir can be classified within nine of these fuel models as indicated by an asterisk below:

1) Grass Group: Fuel Models 1-3 (grass layer carries fire)

a. Short grass* (1 foot)
b. Timber grass and understory
c. Tall grass* (2.5 feet)

2) Shrub Group: Fuel Models 4-7 (shrub layer carries fire)
   a. Chaparral (6 feet)
   b. Brush***** (2 feet)
   c. Dormant brush, hardwood slash*****
   d. Southern rough
3) Timber Group: Fuel Models 8-10 – (forest litter carries fire)
   a. Closed timber litter*
   b. Hardwood litter*
   c. Timber (litter and understory)*
4) Logging Slash Group: Fuel Models 11-13 (logging debris carries fire)
   a. Light logging slash*****
   b. Medium logging slash*****
   c. Heavy logging slash

The four groups above are assigned as related to fuel loading and the distribution of fuel particle size classes. These fuel models are helpful when predicting fire behavior, though one area may be characterized by multiple fuel models. Fuel models Short grass and Timber (litter and understory) are best-suited to fuel loading and forest cover structures found on Fort Belvoir; however, choosing the appropriate model requires experience and personal judgment. An assessment of fuel loadings on Fort Belvoir by experienced personnel, particularly within wildland/urban interfaces, would provide insight into wildland fire risk for the installation.

14.0 Wildland Fuel Factors

Wildfires can cause extensive loss of life, property, and resources. Wildfire prevention is focused on reducing or eliminating the unintentional ignition of wildfires and on the reduction of risks that would contribute to a severe wildland fire situation. Prevention efforts require an analysis of risks, hazards, and values, and require education, awareness, and preparedness. The objective in examining hazards is to determine the degree of difficulty required by suppression

efforts to control a fire ignition. In the absence of prescribed burning, primarily due to air quality concerns, Fort Belvoir should develop management strategies to reduce fuel loadings in areas identified as high-risk. Mechanical removal and mowing as well as elimination of ladder fuels will have the greatest impact to wildland fire risk reduction around urban areas on the installation.

Fire Danger Rating System and Classification

The National Fire Danger Rating System (NFDRS) was developed primarily by the U.S. Forest Service to give national uniformity to recording of fire weather and fire danger rating data and to provide fire managers the means of reliably evaluating the factors influencing fire danger in their area. The first version of the nation system was released in 1972 and was based on engineering and physics principles, rather than local observations, to make it applicable nationwide. Modifications to this system occurred in 1978 and 1988. NFDRS is a system that integrates the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an area's protection needs.

Weather data (temperature, relative humidity, wind direction, wind speed, and rainfall in the last 24 hours) from National Weather Service stations and local forestry offices is analyzed every morning. This analysis results in a predicted fire danger class day, which is broadcast statewide at 10 am daily. When conditions are critical by 2 pm, the day's weather data has been analyzed and an actual fire danger class day is broadcast statewide if necessary.

The FDR classification of an area gives the land manager a tool for daily fire risk decisions and is intended to supplement the fire manager's knowledge of the local area and of consequences to decisions.

Fire Danger Rating Classification:

Class I – LOW

Fires are not likely to become serious and control is relatively easy. Normal field activity is permitted. Firing of incendiaries and outdoor smoking permitted.

Class II – MODERATE
Fires are not likely to become serious and no serious impediments to control are expected. Normal field activity, with a heightened awareness is permitted. Firing of incendiaries and outdoor smoking permitted.

Class III – HIGH
Fires may become serious and control could become difficult, unless extinguished when small. Caution must be used when using incendiary devices (e.g., tracers, smoke grenades, pyrotechnics, or demolitions).

Class IV – VERY HIGH
Fires start easily, spread rapidly, and increase quickly in intensity. All fires are potentially serious. Limit use of incendiary devices unless confined to a fire resistant perimeter (identified jointly with DES – Fire Department). Outdoor smoking permitted only on areas of exposed earth.

Class V – EXTREME
Fires start quickly, spread furiously, and burn intensely. All fires are potentially dangerous. Do not permit use of incendiary devices. Outdoor smoking is not permitted.

15.0 Monitoring Requirements

Fire, whether prescribed or wild, can quickly change the composition and structure of ecological communities and the supported training landscape. A program to monitor fire effects is necessary to assess the impacts of fire on the vegetative community in order to appropriately adjust fire application techniques, protect sensitive resources, and/or determine the need for community restoration.

Fort Belvoir personnel should establish a monitoring program for systematically assessing fire incidences and ecosystem impacts or plant diversity shifts that occur as a result of any wildfire event. Factors to consider within the monitoring program should include post burn evaluations to assess acreage, fire intensity, residual scorch and estimated mortality resulting from the fire. In addition, the vegetation composition change should be documented and monitored, particularly if fire-adaptive invasive species are present in the area.

Response to Wildfires

All wildfire responses on the installation are dispatched by algorithm that determine initial responses. According to the Fort Belvoir Fire Department, the first on-scene command personnel can escalate or de-escalate units as needed. All incidents that are escalated, follow National Incident Management System (NIMS) procedures. To date, no specific wildland Standard Operation Procedures (SOPs) are in-place, and attributed to the infrequency of fire events and the geographical situation of the installation. However, the Fire Department noted that firefighting activities and that abilities for successful mitigation have not been hampered.

16.0 Public Relations

Military installations that deal with fires should adopt a proactive management approach with respect to informing the general public of both intended and unintended burn activities. Proper communication along these lines alleviates general concerns regarding smoke or fire activities and provides for important and favorable public relations. Fire can have impacts that extend beyond the installation boundary, whether due to smoke movement and dispersion or fire escaping. As a result, maintaining positive relationships with the public and keeping them informed of smoke and fire management activities and responses is critical. Since Fort Belvoir does not conduct prescribed burning, efforts from the Public Affairs Office (PAO) should be focused on making installation personnel aware of times of the year when wildfire risks are high and informing the public of wildfire incidences as needed.

FIRE PREVENTION EDUCATION

A key to wildfire prevention is education for increased public and Fort Belvoir user awareness. Successful education programs can help to reduce the incidence of accidentally-ignited wildfires, as well as encourage proper wildfire response procedures. Proper preparation and training will also create a knowledgeable and capable prescribed burning and wildfire response force and provide the basis for coordination in advance emergency situations regarding fire. This preparation revolves around training that produces understanding and knowledge of wildland fire behavior in response to weather, fuel and topographic conditions, understanding and knowledge of firefighting equipment and readiness planning. Each of these components is equally important in the effort of preparation and prevention.

17.0 Funding Requirements

Funding for wildland fire prevention, fuels management for hazard reduction, wildland fire suppression/response, and other wildland fire management is an installation responsibility. According to the Army Wildland Fire Implementation Guidance, an appropriate MDEP: QDPW (Fire and Emergency), should reflect requirements to address the policy guidance for planning and programming. According to the Fort Belvoir Fire Department, funding for all wildfire suppression and management activities are absorbed by the Garrison Commander.

18.0 Personnel Training and Certification Standards and Records

Personnel attend a minimum 144 hour Firefighter Level-I course and 57 hour Firefighter Level II course. These courses may consist of up to 8 hours of forestry incident classroom and hands-on instruction. A separate 16 hour course is offered by the Virginia Department of Forestry; this program will provide the participants the ability to refresh or review skills needed for response to a forestry related fire incident. While none of the current wildland fire personnel have enrolled in the course yet, DES-FES plans for all of them to complete the training within the next three years. The program will be mostly hands-on and will focus on honing chainsaw skills, brush fire strategy and tactics, and other wildland/urban interface topics.

All suppression personnel must pass the annual National Fire Protection Association (NFPA) 1582 medical physical. The NFPA 1582 provides guidelines to ensure that firefighters and candidates are physically capable of performing firefighting tasks. Guidelines cover the medical evaluation process, as well as a list of conditions that would or could prevent a firefighter or candidate from performing as a firefighter by presenting a significant risk to the health or safety of himself/herself and/or others.

19.0 Environmental Assessment

Land managers of military lands are required to apply an ecosystem management approach to natural resources management. Specifically, the DoD Military Services use ecosystem management on their military lands to support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. The INRMP implemented by military installations describes ecosystem management as a holistic approach to the protection of biodiversity. The Fort Belvoir INRMP establishes procedures to ensure the sustainability of the land to accomplish Fort Belvoir's military mission. It outlines conservation efforts for natural resources (e.g., aquatic resources, flora, and fauna) and establishes procedures to ensure compliance with related environmental laws and regulations. The IWFMP will be provided as an Appendix to the INRMP, and the environmental considerations are described in the natural and cultural resources sections of this report.

Appendix E

Fort Belvoir Plant List

FORT BELVOIR PLANT LIST

Elizabeth Fortson Wells, George Washingrton University

June 1999

Nomenclature of all taxa in this list follows Manual of vascular plants of northeastern United States and adjacent Canada, 2nd edition, by Gleason and Cronquist (1991). The divisions of the plant kingdom are arranged by order of increasing advancement. Families within the divisions are arranged alphabetically.

DIVISION LYCOPODIOPSIDA FERN ALLIES

ISOETACEAE

Isoetes engelmannii A. Braun, Engelmann's quillwort (native)

LYCOPODIACEAE

Lycopodium appressum (Chapman) Lloyd & Underw., southern clubmoss (native)
Lycopodium digitatum Dillen, southern ground cedar (native)
Lycopodium tristachyum Pursh, wiry ground cedar (native)

DIVISION POLYPODIOPHYTES FERNS

ASPLENIACEAE

Asplenium platyneuron (L.) Oakes, ebony spleenwort (native)
Athyrium filix-femina (L.) Roth var. *asplenioides* (Michx.) Farw., lady fern (native)
Polystichum acrostichoides (Michx.) Schott, Christmas fern (native)
Thelypteris hexagonoptera (Michx.) Weatherby [*Phegopteris hexagonoptera* (Michx.) Fee], broad beech-fern (native)
Thelypteris noveboracensis (L.) Niewland, New York fern (native)
Thelypteris palustris Schott, marsh fern (native)

BLECHNACEAE

Woodwardia areolata (L.) Moore [*Lorinseria areolata* (L.) Presl], netted chain-fern (native)

DENNSTAEDTIACEAE

Dennstaedtia punctilobula (Michx.) Moore, hay-scented fern (native)
Pteridium aquilinum (L.) Kuhn, bracken fern (native)

ONOCLEACEAE

Onoclea sensibilis L., sensitive fern (native)

OPHIOGLOSSACEAE

Botrychium oneidense (Gilbert) House, blunt-lobed grape fern (native)
Botrychium virginianum (L.) Swartz, rattlesnake fern (native)
Ophioglossum vulgatum L. var. *pycnostichum* Fernald, adder's tongue (native)

OSMUNDACEAE

Osmunda cinnamomea L., cinnamon fern (native)
Osmunda regalis L. var. *spectabilis* (Willd.) Gray, royal fern (native)

POLYPODIACEAE

Polypodium virginianum L., rock cap fern (native)

DIVISION PINOPHYTA GYMNOSPERMS

CUPRESSACEAE
Juniperus virginiana L., eastern red cedar (native)

PINACEAE
Pinus echinata L., shortleaf pine (native)
Pinus resinosa Aiton, red pine (alien; native farther west and north)
Pinus strobus L., white pine (alien; native farther west and north)
Pinus taeda L., loblolly pine (native)
Pinus virginiana Miller, scrub pine, Virginia pine (native)
Tsuga canadensis (L.) Carriere, eastern hemlock (rarely native in Northern Virginia)

DIVISION MAGNOLIOPHYTA ANGIOSPERMS

CLASS MAGNOLIOPSIDA DICOTYLEDONS

ACERACEAE
Acer negundo L., boxelder (native)
Acer rubrum L., red maple (native)
Acer saccharinum L., silver maple (native)

AMARANTHACEAE
Alternanthera philoxeroides (Mart.) Griseb., alligator weed (alien)

ANACARDIACEAE
Rhus copallinum L., shining sumac (native)
Rhus glabra L., smooth sumac (native)
Rhus typhina L., staghorn sumac (native)
Toxicodendron radicans (L.) Kuntze, poison ivy (native)

ANNONACEAE
Asimina triloba (L.) Dunal, pawpaw (native)

APIACEAE
Daucus carota L., Queen Anne's lace (alien)
Cryptotaenia canadensis (L.) DC., honewort (native)
Hydrocotyle americana L., marsh pennywort (native)
Osmorhiza longistylis (Torr.) DC., long-styled sweet cicely (native)
Sanicula marilandica L., black snakeroot (native)
Sanicula canadensis L., Canada sanicle (native)

APOCYNACEAE
Apocynum cannabinum L., Indian hemp (native)
Vinca minor L., periwinkle (alien)

AQUIFOLIACEAE
Ilex opaca Aiton, American holly (native)

Ilex verticillata (L.) A Gray, winterberry (native)

ARALIACEAE
Aralia spinosa L., Hercules's club (native)
Hedera helix L., English ivy (alien)

ARISTOLOCHIACEAE
Aristolochia serpentaria L., Virginia snakeroot (native)
Asarum canadense L., wild ginger (native)

ASCLEPIADACEAE
Asclepias incarnata L. var. *pulchra* (Ehrh.) Pers., swamp milkweed (native)
Asclepias syriaca L., common milkweed (native)
Asclepias tuberosa L., butterfly weed (native)

ASTERACEAE
Achillea millefolium L., yarrow (alien)
Ambrosia artemisiifolia L., common ragweed (native)
Antennaria plantaginifolia (L.) Richards, pussy toes (native)
Anthemis arvensis L., corn chamomile (alien)
Arctium minus (Hill) Bernhardi, burdock (alien)
Artemisia vulgaris L., mugwort (alien)
Aster divaricatus L., white heart-leaved aster (native)
Aster lateriflorus (L.) Britton, goblet aster (native)
Aster pilosus Willd., awl aster (native)
Bidens bipinnata L., spanish needles (native)
Bidens frondosa L., devil's beggar ticks (native)
Bidens laevis (L.) BSP., bur-marigold (native)
Centaurea maculosa Lam., spotted knapweed (alien)
Chrysanthemum leucanthemum L., [*Leucanthemum vulgare* Lam.], ox-eye daisy (alien)
Cirsium discolor (Muhl.) Sprengel, field thistle (native)
Cirsium vulgare (Savi) Tenore [*Cirsium lanceolatum* (L.) Hill, *Carduus lanceolatus* L.] , bull thistle (alien)
Conyza canadensis (L.) Cronq. [*Erigeron canadensis* L.], horseweed (native)
Erechtites hieracifolia (L.) Raf., fireweed (native)
Erigeron annuus (L.) Pers., annual fleabane (native)
Erigeron philadelphicus L., Philadelphia daisy (native)
Erigeron strigosus Muhl., rough fleabane (native)
Eupatorium coelestinum L. [*Conoclinium coelestinum* (L.) DC.], mist flower (native)
Eupatorium dubium Willd., joe-pye weed (native)
Eupatorium fistulosum Barratt, hollow-stemmed joe-pye weed (native)
Eupatorium hyssopifolium L., eupatorium (native)
Eupatorium serotinum Michx., late eupatorium (native)
Gnaphalium obtusifolium L., fragrant cudweed (native)
Gnaphalium purpureum L., purple cudweed (native)
Hieracium gronovii L., beaked hawkweed (native)
Hieracium venosum L., rattlesnake weed (native)
Hypochoeris radicata L., spotted cat's ear (alien)
Krigia virginica (L.) Willdenow, dwarf dandelion (native)

Lactuca canadensis L., tall lettuce (native)
Lactuca floridana (L.) Gaertner, woodland lettuce (native)
Mikania scandens (L.) Willd., climbing hempweed (native)
Polymnia uvedalia L., yellow-flowered leaf-cup (native)
Rudbeckia fulgida Aiton, eastern coneflower (native)
Rudbeckia hirta L., black-eyed Susan (native)
Rudbeckia laciniata L., cutleaf coneflower (native)
Senecio aureus L., heart-leaved groundsel (native)
Silphium trifoliatum L., whorled rosin-weed (native)
Solidago flexicaulis L., goldenrod (native)
Solidago graminifolia (L.) Salisbury, goldenrod (native)
Solidago nemoralis Aiton, goldenrod (alien)
Taraxacum officinale Wiggers, dandelion (alien)
Tragopogon dubius Scop., goat-beard (alien)
Tussilago farfara L., coltsfoot (alien)
Verbesina occidentalis (L.) Walter, southern flatseed-sunflower (native)
Xanthium strumarium L., common cocklebur (alien)

BALSAMINACEAE
Impatiens capensis Meerburg, touch-me-not (native)

BERBERIDACEAE
Berberis thunbergii DC., Japanese barberry (alien)
Podophyllum peltatum L., May-apple (native)

BETULACEAE
Alnus serrulata (Aiton) Willd., smooth alder (native)
Betula nigra L., river birch (native)
Carpinus caroliniana Walter, hornbeam (native)
Corylus americana Walter, American hazel-nut (native)

BIGNONIACEAE
Campsis radicans (L.) Seemann, trumpet creeper (native)
Catalpa speciosa Warder, northern catalpa (alien; native farther west in U.S.)
Paulownia tomentosa (Thunb.) Steudel, empress tree (alien)

BORAGINACEAE
Cynoglossum virginianum L., wild comfrey (native)
Mertensia virginica (L.) Pers., eastern bluebell (native)
Myosotis arvensis (L.) Hill, field scorpion-grass (alien)
Myosotis laxa Lehm., smaller forget-me-not (native)

BRASSICACEAE
Alliaria petiolata (Bieb.) Cavara & Grande, garlic mustard (alien)
Arabis laevigata (Muhl.) Poiret, rock cress (native)
Barbarea vulgaris R. Brown, yellow rocket, winter cress (alien)
Brassica napus L., turnip (alien)
Capsella bursa-pastoris (L.) Medikus, shepherd's purse (alien)

Cardamine concatenata (Michx.) O. Schwarz, five-parted toothwort (native)
Cardamine hirsuta L., hoary bitter cress (alien)
Cardamine pensylvanica Muhl., Pennsylvania bitter cress (native)
Cardamine rhomboidea (Pers.) DC. [*Cardamine bulbosa* (Scheb.) BSP], spring cress (native)
Lepidium campestre (L.) R. Brown, field cress (alien)
Lepidium virginicum L., poor man's pepper (native)
Rorippa palustris (L.) Besser, common yellow cress (native)

CAESALPINIACEAE
Cercis canadensis L., redbud (native)
Chamaecrista fasciculata (Michx.) Greene [*Cassia fasciculata* Michx.], partridge pea (native)
Gleditsia triacanthos L., honey locust (alien; native farther west in U.S.)
Senna hebecarpa (Fern.) Irwin & Barneby [*Cassia hebecarpa* Fern.], northern wild senna (native)

CALLITRICHACEAE
Callitriche heterophylla Pursh, water-starwort (native)

CANNABACEAE
Humulus japonicus Siebold & Zucc., Japanese hops (alien)

CAMPANULACEAE
Lobelia cardinalis L., cardinal flower (native)
Lobelia inflata L., Indian tobacco (native)
Lobelia siphilitica L., lobelia (native)
Triodanis perfoliata (L.) Nieuwland [*Specularia perfoliata* (L.) DC.], Venus's looking glass (native)

CAPRIFOLIACEAE
Lonicera japonica Thunberg, Japanese honeysuckle (alien)
Lonicera maackii (Rupr.) Maxim, oriental bush honeysuckle (alien)
Lonicera sempervirens L., trumpet honeysuckle (native)
Sambucus canadensis L., elderberry (native)
Symphoricarpos orbiculatus Moench, coral berry (native)
Viburnum acerifolium L., flowering maple (native)
Viburnum dentatum L., arrow-wood (native)
Viburnum nudum L., possum haw (native)
Viburnum prunifolium L., black haw (native)

CARYOPHYLLACEAE
Arenaria lateriflora L., sandwort (native)
Cerastium nutans Raf., mouse-ear chickweed (alien)
Cerastium semidecandrum L., mouse-ear chickweed (alien)
Dianthus armeria L., Deptford-pink (alien)
Saponaria officinalis L., soapwort (alien)
Silene antirrhina L., catchfly (native)
Silene latifolia Poiret [*Lychnis alba* Miller], white campion (alien)
Stellaria media (L.) Cyrillo, chickweed (alien)
Stellaria graminea L., common stichwort (alien)
Stellaria pubera Michx., giant chickweed (native)

CELASTRACEAE
Celastrus orbiculatus Thunberg, oriental bittersweet (alien)
Euonymus americanus L., strawberry bush (native)

CHENOPODIACEAE
Chenopodium album L., lamb's quarter (alien)
Chenopodium ambrosioides L., Mexican tea (alien; native of tropical America)

CLUSIACEAE
Hypericum hypericoides (L.) Crantz, St. Andrew's cross (native)
Hypericum mutilum L., small St. John's wort (native)
Hypericum perforatum L., common St. John's wort (alien)
Hypericum punctatum Lam., spotted St. John's wort (native)

CONVOLVULACEAE
Calystegia sepium (L.) R. Br., hedge bindweed (native)
Ipomoea lacunosa L., white morning-glory (native)

CORNACEAE
Cornus amomum Miller, swamp dogwood (native)
Cornus florida L., flowering dogwood (native)
Nyssa sylvatica Marshall var. *sylvatica*, black gum (native)
Nyssa sylvatica Marshall var. *biflora* (Walter) Sargent, swamp black gum (native)

CRASSULACEAE
Sedum ternatum Michx., stonecrop (native)

CUCURBITACEAE
Sicyos angulatus L., bur cucumber (native)

CUSCUTACEAE
Cuscuta compacta Jussieu, dodder (native)
Cuscuta gronovii Willd., common dodder (native)

EBENACEAE
Diospyros virginiana L., persimmon (native)

ELAEAGNACEAE
Elaeagnus angustifolia L., Russian olive (alien)
Elaeagnus pungens Thunb., thorny eleagnus (alien)
Elaeagnus umbellata Thunb., autumn olive (alien)

ERICACEAE
Chimaphila maculata (L.) Pursh, spotted wintergreen (native)
Epigaea repens L., trailing arbutus (native)
Eubotrys racemosa (L.) Nutt. [*Leucothoe racemosa* (L.) Gray], swamp fetterbush (native)
Gaylusaccia baccata (Wangenh.) K. Koch, black huckleberry (native)
Gaylusaccia frondosa (L.) T. & G., dangleberry (native)

Lyonia ligustrina (L.) DC., male-berry (native)
Kalmia latifolia L., mountain laurel (native)
Rhododendron periclymenoides (Michx.) Shinn. [*R. nudiflorum* (L.) Torr.], pinkster flower (native)
Rhododendron viscosum (L.) Torr., swamp azalea (native)
Vaccinium corymbosum L.,[includes *Vaccinium atrococcum*], highbush blueberry (native)
Vaccinium pallidum Aitons [includes *Vaccinium vacillans*], hillside blueberry (native)
Vaccinium stamineum L., deerberry (native)

EUPHORBIACEAE
Euphorbia maculata L. [*Euphorbia supina* Raf.], spotted spurge (native)

FABACEAE
Amorpha fruticosa L., false indigo (native)
Amphicarpaea bracteata (L.) Fern., hog-peanut (native)
Baptisia tinctoria (L.) R. Brown, yellow wild indigo (native)
Coronilla varia L., crown vetch (alien)
Desmodium nudiflorum (L.) DC., naked tick-trefoil (native)
Desmodium paniculatum (L.) DC., beggar's ticks (native)
Galactia regularis (L.) BSP [*Galactia volubilis* (L.) Britton], milk pea (native)
Lespedeza bicolor Turcz., shrubby lespedeza (alien)
Lespedeza cuneata (Dum. Cours.) G. Don, Chinese lespedeza (alien)
Lespedeza repens (L.) Barton, smooth trailing lespedeza (native)
Lespedeza stipulacea Maxim, Korean clover (alien)
Lespedeza striata (Thunb.) Hook. & Arnott, Japanese clover (alien)
Medicago lupalina L., black medick (alien)
Melilotus alba Medikus, white sweet clover (alien)
Melilotus officinalis (L.) Pallas, yellow sweet clover (alien)
Pueraria lobata (Willd.) Ohwi, kudzu (alien)
Robinia pseudoacacia L., black locust (native)
Stylosanthes biflora (L.) BSP, pencil flower (native)
Tephrosia virginiana (L.) Pers., goat's rue (native)
Trifolium aureum Pollich, [*Trifolium agrarium* L.], palmate hop-clover (alien)
Trifolium arvense L., rabbit-foot clover (alien)
Trifolium campestre Schreber, pinnate hop-clover (alien)
Trifolium dubium Sibth., little hop-clover (alien)
Trifolium pratense L., red clover (alien)
Trifolium repens L., white clover (alien)
Vicia angustifolia L., narrow-leaved vetch (alien)
Wisteria sinensis (Sims) Sweet, Chinese wisteria (alien)

FAGACEAE
Castanea pumila (L.) Miller, chinquapin (native)
Fagus grandifolia Ehrh., beech (native)
Quercus alba L., white oak (native)
Quercus coccinea Muenchh., scarlet oak (native)
Quercus falcata Michx., southern red oak (native)
Quercus ilicifolia Wangenh., bear oak (native)
Quercus palustris Muenchh., pin oak (native)

Quercus phellos L., willow oak (native)
Quercus prinus L., rock chestnut oak (native)
Quercus rubra L., red oak (native)
Quercus stellata Wangenh., post oak (native)
Quercus velutina Lam., black oak (native)

FUMARIACEAE
Corydalis flavula (Raf.) DC., corydalis (native)
Dicentra cucullaria (L.) Bernh., Dutchman's breeches (native)

GERANIACEAE
Geranium carolinianum L., cranesbill (native)

HALORAGACEAE
Myriophyllum spicatum L., European water milfoil (alien)

HAMAMELIDACEAE
Hamamelis virginiana L., witch hazel (native)
Liquidambar styraciflua L., sweet gum (native)

HYDROCHARITACEAE
Hydrilla verticillata (L.f.) Royle, hydrilla (alien)

JUGLANDACEAE
Carya cordifolrmis (Wangeh.) K. Koch, bitternut-hickory (native)
Carya glabra (Miller) Sweet, pignut hickory (native)
Carya tomentosa (Poiret) Nutt., mockernut hickory (native)
Juglans nigra L., black walnut (native)

LAMIACEAE
Blephilia hirsuta (Pursh) Benth. (native)
Collinsonia canadensis L., northern horse-balm (native)
Cunila origanoides (L.) Britton, stone mint (native)
Glechoma hederacea L., ground ivy (alien)
Hedeoma pulegioides (L.) Persoon, pennyroyal (native)
Lamium amplexicaule L., henbit (alien)
Lamium purpureum L., red dead nettle (alien)
Lycopus americana Muhl., American water horehound (native)
Mentha piperita L., peppermint (alien)
Perilla frutescens (L.) Britton, beefsteak plant (alien)
Prunella vulgaris L., self-heal (alien)
Pycnanthemum tenuifolium Schrader, mountain mint (native)
Salvia lyrata L., sage (native)
Scutellaria elliptica Muhl., skullcap (native)
Teucrium canadense L., American germander (native)

LARDIZABALACEAE
Akebia quinata (Houtt.) Decne, fiveleaf akebia (alien)

LAURACEAE
Lindera benzoin (L.) Blume, spicebush (native)
Sassafras albidum (Nuttall) Nees, sassafras (native)

LINACEAE
Linum virginianum L.,Virginia yellow flax (native)

LYTHRACEAE
Lythrum salicaria L., purple loosestrife (alien)

MAGNOLIACEAE
Liriodendron tulipifera L., tulip tree (native)
Magnolia virginiana L., sweet bay (native)

MALVACEAE
Hibiscus moscheutos L., rose mallow (native)

MIMOSACEAE
Albizia julibrissin Durazz, mimosa (alien)

MORACEAE
Morus alba L., white mulberry (alien)
Morus rubra L., red mulberry (native)

NYMPHAEACEAE
Nuphar advena (Aiton) Aiton f. [*N. luteum* (L.) Sibthorp & Smith], yellow water-lily (native)

OLEACEAE
Chionanthus virginicus L., fringe tree (native)
Forsythia suspensa (Thunb.) Vahl, golden bells (alien)
Fraxinus pennsylvanica Marshall, green ash (native)
Ligustrum sinense Loureiro, swamp privet (alien)

ONAGRACEAE
Circaea lutetiana L. var. *canadensis*(L.) A.& M., common enchanter's nightshade (native)
Ludwigia alternifolia L., square-pod water primrose (native)
Ludwigia palustris (L.) Elliott, common water-purslane (native)
Ludwigia peploides (HBK.) Raven, floating seedbox (alien)
Oenothera biennis L., common evening-primrose (native)

OROBANCHACEAE
Epifagus virginiana (L.) Barton, beech-drops (native)

OXALIDACEAE
Oxalis stricta L., wood sorrel (native)
Oxalis violacea L., violet wood-sorrel (native)

PASSIFLORACEAE

Passiflora lutea L., passion flower (native)

PHYTOLACCACEAE
Phytolacca americana L., pokeweed (native)

PLANTAGINACEAE
Plantago aristata Michx., buckhorn (native)
Plantago lanceolata L., English plantain (alien)
Plantago major L., common plantain (alien)
Plantago rugelii Decne., American plantain (native)

PLATANACEAE
Platanus occidentalis L., sycamore (native)

POLYGALACEAE
Polygala sanguinea L., blood milkwort (native)
Polygala incarnata L., pink milkwort (native)

POLYGONACEAE
Polygonum arifolium L., halberd-leaved tearthumb (native)
Polygonum cespitosum Blume, lady's thumb (alien)
Polygonum cuspidatum Sieb. & Zucc., Japanese knotweed (alien)
Polygonum perfoliatum L., mile-a-minute (alien)
Polygonum persicaria L., lady's thumb (alien)
Polygonum punctatum Elliott, dotted smartweed (native)
Polygonum sagittatum L., arrow-leaved tearthumb (native)
Polygonum virginianum L., jumpseed (native)
Rumex acetosella L., red sorrel (alien)
Rumex crispus L., curly dock (alien)

PORTULACACEAE
Claytonia virginiana L., spring beauty (native)

PRIMULACEAE
Lysimachia ciliata L., fringed loosestrife (native)
Lysimachia nummularia L, moneywort (alien)
Lysimachia quadrifolia L., whorled loosestrife (native)

RANUNCULACEAE
Cimicifuga racemosa (L.) Nutt., black snakeroot (native)
Clematis terniflora DC. [*Clematis dioscoreifolia* Levl. & Vaniot], Japanese virgin's bower (alien)
Clematis virginiana L., virgin's bower (native)
Ranunculus abortivus L., small-flowered crowfoot (native)
Ranunculus alleghiensis Britton, Allegheny buttercup (native)
Ranunculus ambigens S. Wats., water-plantain spearwort (native)
Ranunculus bulbosus L., common buttercup (alien)
Ranunculus ficaria L., lesser celandine (alien)
Ranunculus recurvatus Poiret, hooked crowfoot (native)

Thalictrum clavatum DC., mountain meadow-rue (native)
Thalictrum dioicum L., early meadow-rue (native)

ROSACEAE
Agrimonia parviflora Aiton, southern agrimony (native)
Amelanchier arborea (Michaux f.) Fernald, serviceberry (native)
Duchnesea indica (Andrews) Focke, Indian strawberry (alien)
Fragaria virginiana Duchesne, strawberry (native)
Geum canadense Jacq., avens (native)
Potentilla canadensis L., running five fingers (native)
Potentilla recta L., sulphur five fingers (alien)
Potentilla simplex Michx., old-field five fingers (alien)
Prunus mahaleb L., mahaleb-cherry (alien)
Prunus serotina Ehrh., black cherry (native)
Pyrus malus L., apple (alien)
Rosa multiflora Thunberg, multiflora rose (alien)
Rosa palustris Marshall, swamp rose (native)
Rosa wichuraiana Crepin, memorial rose (alien)
Rubus argutus Link, southern blackberry (native)
Rubus bifrons Vest, Himalaya-berry (alien)
Rubus occidentalis L., black raspberry (native)
Rubus phoenicolasius Maxim, wineberry (alien)
Spiraea japonica L.f., Japanese spirea (alien)

RUBIACEAE
Cephalanthus occidentalis L., common buttonbush (native)
Galium aparine L., cleavers (native)
Galium circaezans Michx., forest bedstraw (native)
Galium obtusum Bigelow, blunt-leaved bedstraw (native)
Galium triflorum Michx., sweet-scented bedstraw (native)
Hedyotis caerulea (L.) Hook, [*Houstonia caerulea* L.], mountain bluets (native)
Hedyotis longifolia (Gaertner) Hook. [*Houstonia longifolia* Gaertner] (native)
Hedyotis purpurea (L.) T. & G. [*Houstonia purpurea* L.] (native)
Hedyotis nuttalliana Fosb. [*Houstonia tenuifolia* Nuttall] (native)
Mitchella repens L., partridge berry (native)

RUTACEAE
Poncirus trifoliata (L.) Raf., trifoliate orange (alien)

SALICACEAE
Populus alba L., white poplar (alien)
Populus deltoides Marshall, cottonwood (native)
Populus grandidentata Michx., big-toothed aspen (native)
Salix nigra Marshall, black willow (native)

SAURURACEAE
Saururus cernuus L., lizard's tail (native)
SAXIFRAGACEAE

Penthorum sedoides L., ditch stonecrop (native)

SCROPHULARIACEAE
Gratiola neglecta Torr., hedge hyssop (native)
Linaria canadensis (L.) Dumont, toad flax (native)
Lindernia dubia (L.) Pennell, false pimpernel (native)
Mazus pumilus (Burm. f.) van Steenis [*Mazus japonicus* (Thunb.) Kuntze] (alien)
Mimulus ringens L., Allegheny monkey-face (native)
Penstemon digitalis Nutt., white beard-tongue (native)
Verbascum thapsus L., common mullein (alien)
Verbascum blattaria L., moth-mullein (alien)
Veronica arvensis L., corn speedwell (alien)
Veronica officinalis L., common speedwell (alien)
Veronica serpyllifolia L., thyme-leaved speedwell (alien)

SOLANACEAE
Datura stramonium L., jimson weed (possibly native)
Solanum carolinense L., horse nettle (native)
Solanum nigrum L. [includes *Solanum americana* Miller], black nightshade (native)

SIMAROUBACEAE
Ailanthus altissima (Miller) Swingle, tree of heaven (alien)

ULMACEAE
Celtis laevigata Willd., southern hackberry (native)
Ulmus americana L., American elm (native)
Ulmus pumila L., Siberian elm (alien)
Ulmus rubra Muhl, slippery elm (native)

URTICACEAE
Boehmeria cylindrica (L.) Swartz (native)
Laportea canadensis (L.) Wedd., stinging nettle (native)

VALERIANACEAE
Valerianella radiata (L.) Dufr., corn salad (native)
Valerianella locusta (L.) Betcke, European corn salad (alien)

VERBENACEAE
Verbena hastata L., common vervain (native)
Verbena urticifolia L., white verbain (native)

VIOLACEAE
Viola rafinesquii Greene (native)
Viola pedata L., bird-foot violet (native)
Viola sagittata Aiton, arrowhead violet (native)
Viola sororia Willd., [*Viola affinis* Le Conte, *Viola papilionacea* Pursh], dooryard violet (native)

VITACEAE

Ampelopsis brevipedunculata (Maxim) Trautv., porcelain berry
Parthenocissus quinquefolia (L.) Planchon, Virginia creeper (native)
Vitis aestivalis Michx., summer grape (native)
Vitis labrusca L., fox-grape (native)
Vitis vulpina L., frost-grape (native)

CLASS LILIOPSIDA MONOCOTYLEDONS

AGAVACEAE
Yucca filamentosa L., Adam's needle (native)

ALISMATACEAE
Alisma subcordatum Raf., southern water-plantain (native)
Sagittaria latifolia Willd., common arrow-head (native)

ARACEAE
Arisaema triphyllum (L.) Schott, jack in the pulpit (native)
Orontium aquaticum L., golden club (native)
Peltandra virginica (L.) Kunth (native)
Symplocarpus foetidus (L.) Nutt., skunk cabbage (native)

COMMELINACEAE
Commelina communis L., asiatic dayflower (alien)
Murdannia keisak (Hassk.) Hand.-Mazz., aneilima (alien)

CYPERACEAE
Carex albolutescens Schweinitz (native)
Carex comosa F. Boott (native)
Carex crinita Lam. (native)
Carex flaccosperma Dewey (native)
Carex frankii Kunth (native)
Carex granularis Muhl. ex Schkuhr. (native)
Carex laevivaginata ((Kuk.) Mackenzie (native)
Carex lurida Wahlenb. (native)
Carex nigromarginata Schweinitz (native)
Carex radiata (Wahlenb.) Small [*Carex rosea* Schkuhr] (native)
Carex squarrosa L. (native)
Carex tribuloides Wahlenb. (native)
Carex umbellata Schkuhr (native)
Carex vulpinoidea Michx. var. *ambigua* F. Boott. (native)
Carex vulpinoidea Michx. var. *vulpinoidea* (native)
Cyperus iria L., iria flatsedge (alien)
Eleocharis equisetoides (Elliott) Torr., spike-rush (native)
Eleocharis ovata (Roth) Roemer & Schultes [*Eleocharis obtusa* (Willd.) Schultes], blunt spike-rush (native)
Scirpus atrovirens Willd., black bulrush (native)
Scirpus cyperinus (L.) Kunth, wool-grass (native)
Scirpus polyphyllus Vahl, many-leaved bulrush (native)
DIOSCOREACEAE

Dioscorea batatas Decne., cinnamon-vine (alien)
Dioscorea villosa L., colic root (native)

IRIDACEAE
Iris pseudacorus L., yellow iris (alien)
Iris virginica L., southern blue flag (native)
Sisyrinchium angustifolium Miller (native)
Sisyrinchium mucronatum Michx. (native)

JUNCACEAE
Juncus acuminatus Michx., rush (native)
Juncus biflorus Elliott [*Juncus marginatus* Rostk. var. *biflorus* (Elliott) Torr.], rush (native)
Juncus diffusissimus Buckley, slimpod rush (native)
Juncus effusus L., rush (native)
Juncus tenuis Willd., path rush (native)
Luzula bulbosa (Wood) Rydberg, wood rush (native)
Luzula echinata (Small) Hermann, wood rush (native)

LEMNACEAE
Lemna minor L., duckweed (native)
Lemna perpusilla Torr., duckweed (native)
Spirodela polyrhiza (L.) Schleiden, duckweed (native)

LILIACEAE
Allium vineale L., field garlic (alien)
Erythronium americanum Ker Gawler, trout lily (native)
Hemerocallis fulva (L.) L., day-lily (alien)
Hypoxis hirsuta (L.) Cov., common star-grass (native)
Medeola virginiana L., Indian cucumber root (native)
Narcissus pseudo-narcissus L., daffodil (alien)
Ornithogalum umbellatum L., star of Bethlehem (alien)
Uvularia perfoliata L., bellwort (native)
Uvularia sessilifolia L., bellwort (native)

ORCHIDACEAE
Cypripedium acaule Aiton, pink lady-slipper (native)
Goodyera pubescens (Willd.) R. Brown, downy rattlesnake plantain (native)
Habenaria lacera (Michx.) Lodd., ragged fringed orchid (native)
Liparis liliifolia (L.) Rich., large twayblade (native)
Tipularia discolor (Pursh) Nutt., crane-fly orchid (native)

POACEAE
Agrostis gigantea Roth, redtop (alien)
Anthoxanthum odoratum L., sweet vernal grass (alien)
Arthraxon hispidus (Thunb.) Makino, joint-headed arthraxon (alien)
Bromus japonicus Thunb., Japonese chess (alien)
Calamovilfa brevipilis (Torrey) Scribner (native)
Cynodon dactylon (L.) Pers., Bermuda grass (alien)

Dactylis glomerata L., orchard grass (alien)
Danthonia spicata (L.) F. Beauv., poverty oatgrass (native)
Echinochloa crusgalli (L.) P. Beauv., barnyard grass (alien)
Echinochloa walteri (Pursh) Heller, Walter's wild millet (native)
Elymus virginicus L., Virginia wild rye (native)
Festuca elatior L., tall fescue (alien)
Holcus lanatus L., velvet grass (alien)
Imperata cylindrica (L.) Beauv., cogon grass (alien)
Leersia oryzoides (L.) Swartz, rice cut-grass (native)
Leersia virginica Willd., white grass (native)
Lolium perenne L. var. *aristatum* Willd., Italian ryegrass (alien)
Microstegium vimineum (Trin.) A. Camus, Japanese stilt grass (alien)
Miscanthus sinensis Andersson, eulalia (alien)
Panicum anceps Michx., panic grass (native)
Panicum clandestinum L. [*Dichanthelium clandestinum* (L.) Gould], (native)
Panicum latifolium L. [*Dichanthelium latifolium* (L.) Harvill], (native)
Panicum laxifolium Lam. [*Dichanthelium laxifolium* (Lam.) Gould], (native)
Phalaris arundinacea L., reed canary grass (native)
Phleum pratense L., timothy (alien)
Phragmites australis (Cav.) Trin, common reed (alien)
Poa pratensis L., Kentucky bluegrass (native)
Poa trivialis L., rough bluegrass (alien)
Schizachyrium scoparium (Michx.) Nash, [*Andropogon scoparium* Michx.] little bluestem (native)
Setaria faberi R. Herrm., giant foxtail grass (alien)
Sorghum halepense (L.) Pers., Johnson grass (alien)
Tripsacum dactyloides (L.) L., gama-grass (native)

PONTEDERIACEAE
Pontederia cordata L., pickerel-weed (native)

SMILACINACEAE
Smilax glauca Walter, greenbrier (native)
Smilax rotundifolia L., greenbrier (native)

SPARGANIACEAE
Sparganium americanum Nutt., bur-reed (native)

TYPHACEAE
Typha angustifolia L., narrow-leaved cattail (native)
Typha latifolia L., common cattail (native)

Appendix F

Plant Community Narrative Descriptions

Plant Communities Mapped on Fort Belvoir Prior to the Development of the Nature Conservancy's National Vegetation System.

Oak/Ericad (Heath Family) Forests

Oak/ericad forests are upland forests of gravelly ridges and dry slopes, generally located at the tops of hills and bluffs and along steep, well-drained slopes. The overstory is dominated by chestnut oak (*Quercus prinus*), with a mixture of northern red oak (*Quercus rubra*), white oak (*Quercus alba*), and scarlet oak (*Quercus coccinea*). At Fort Belvoir, vegetation in the understory varies between two topographically different types. Arid plateaus are generally composed of chestnut oak and white oak with huckleberry (*Gaylussacia baccata*) and deerberry (*Vaccinium stamineum*) in the understory. Cooler, northerly-facing steep slopes are dominated by chestnut oak, and the understory generally consists of mountain laurel (*Kalmia latifolia*) (Paciulli, Simmons and Associates, Ltd., 1998).

Beech Mixed Oak Forests

At Fort Belvoir, beech mixed oak forests are generally located on the more gradual slopes, topographically below oak/ericad forests. Mixed oak species of white oak and northern red oak are dominant trees with American beech (*Fagus grandifolia*) dominant as shrubs in the understory. Other common shrubs in the understory consist of flowering dogwood (*Cornus florida*), red maple (*Acer rubrum*), and cherryleaf viburnum (*Viburnum prunifolium*). Occasional areas of mature American beech are found in lower, moister elevations or within ravines (Paciulli, Simmons and Associates, Ltd., 1998).

Tulip Poplar Mixed Hardwood Forest

Tulip poplar mixed hardwood forests are upland forests of moist fertile ravine slopes and ravine bottoms. At Fort Belvoir, they are found in habitats similar to beech mixed oak forest, but are more common on more gradual slopes and ravine bottoms. Tulip poplar (*Liriodendron tulipifera*) trees are dominant within this vegetation community type, but American beech, white oak, and northern red oak are also mixed. Understory species are similar to that of beech mixed oak forests and consist of flowering dogwood, American beech, and red maple shrubs (Paciulli, Simmons and Associates, Ltd., 1998).

A tulip popular mixed hardwood forest community just west of the mouth of Accotink Creek, within the Accotink Bay Wildlife Refuge, has been identified as a significant community of its type due to its age and extent. This community type is common in Virginia; however, mature examples are rare (Hobson, 1996).

Seep Forests

Seep forests are often open-canopy forests of groundwater-saturated flats and slopes, generally surrounded by mixed hardwood forests. They occur along slopes where groundwater flows to the surface. Characteristic species are red maple, black gum (*Nyssa sylvatica*), sweetbay magnolia (*Magnolia virginiana*), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), and royal fern (*Osmunda regalis*). Key indicators are large mats of skunk cabbage and other herbaceous wetland vegetation. Although not a dominant forest type, seep forests are of special interest at Fort Belvoir, because they provide unique wetland habitats within the dominant upland forests (Paciulli, Simmons and Associates, Ltd., 1998).

Three acid seep swamps on Fort Belvoir have been identified as significant vegetation communities. One

of these is adjacent to the fresh tidal marsh at the mouth of Accotink Creek, another lies at the foot of upland slopes in Training Areas T-9 and T-7, and the third is located on HEC in the Dogue Creek watershed. These seeps provide habitat on Fort Belvoir for the state rare sphagnum sprite (*Nehalennia gracilis*) and a state rare sedge (*Carex vestita*). They also provide habitat for several watchlist species (species ranked by DCR-NHP as S3 – "rare to uncommon," or SU – "status uncertain") including the gray petaltail (*Tachopteryx thoreyi*), aurora damsel (*Chromagrion conditum*), and eastern red damsel (*Amphiagrion saucium*). The watchlist dragonfly species, *Gomphaeschna furcillata,* has also been recorded in this habitat on Fort Belvoir (Hobson, 1996).

Mixed Pine Hardwood Forests

Mixed pine hardwood forests consist of transitional forests between early successional pine and climax hardwood types. Vegetation is a variable mix of pines, oaks, and other hardwoods. At Fort Belvoir, mixed pine hardwood forests were identified where hardwoods and pine trees appeared to be evenly distributed or where neither hardwoods nor pines appeared to be more than 70% dominant. Virginia pine is the dominant pine in mixed pine hardwood forests, although some stands mixed with loblolly pine exist. Dominant hardwoods in mixed pine hardwood forests are variable, but can be generalized based on topography and their position bordering mapped hardwoods. For example, mixed pine hardwood forests mapped at the tops of dry ridges and bordered by oak/ericad forest are likely to have chestnut oak or scarlet oak as the dominant hardwood in the mix. Lowland areas tend to have tulip poplar and red maple mixed with Virginia pine. Upland areas tend to be mixed with white oak and chestnut oak (Paciulli, Simmons and Associates, Ltd., 1998).

Virginia Pine Forests

Virginia pine forests consist of early successional forest of old fields or other land clearings dominated by Virginia pine (greater than 70% dominance). Virginia pines are most abundant and occur naturally compared to forests of loblolly pine and white pine, which most likely have been introduced by plantings in former clearings (Paciulli, Simmons and Associates, Ltd., 1998).

Loblolly Pine Forest

Small portions of the installation have been planted in loblolly pine. The loblolly pine forests at Fort Belvoir are usually planted and often appear in rows. Native stands are not prevalent at Fort Belvoir (Paciulli, Simmons and Associates, Ltd., 1998).

White Pine Forest

One stand of planted white pine large enough for mapping occurs at the Elhers Road entrance to Davison Army Airfield. White pine is also used throughout Fort Belvoir for landscaping; however, these areas were not included because they are located within improved grounds (Paciulli, Simmons and Associates, Ltd., 1998).

Moderately Well-Drained Floodplain Hardwood Forests

Moderately well-drained floodplain hardwood forests are dominant within the major floodplains. They are palustrine forests of moderately well-drained to somewhat poorly-drained floodplain bottomland. These hardwood forests are generally located above streambanks in non-hydric soils that are mixed with

upland and wetland vegetation. They are flooded regularly, but the well-drained soils do not retain hydrology long enough to support wetland vegetation. At Fort Belvoir, moderately well-drained floodplain hardwood forests are dominated by tulip poplar mixed with red maple and sweet gum (*Liquidambar styraciflua*) trees. The understory consists of ironwood (*Carpinus caroliniana*), red maple, and spicebush (*Lindera benzoin*) shrubs. In both the moderately well-drained floodplain hardwood forests and tulip poplar mixed hardwood forests, the tulip poplar is the dominant indicator species. However, the composition of other characteristic species is significantly different. Characteristic species of moderately well-drained floodplain hardwood forests are adapted to moister soils within the floodplain (Paciulli, Simmons and Associates, Ltd., 1998).

Poorly Drained Floodplain Hardwood Forest

The poorly drained floodplain hardwood forest type is a palustrine forest occurring on somewhat poorly-drained to very poorly-drained floodplain bottomlands and sloughs. Its composition is variable, and it is generally located on hydric soils (soils that are inundated or saturated for a significant amount of time so that anaerobic conditions are created) dominated by hydrophytic vegetation (plants typically found in wetland habitats). They are most extensive along Pohick Creek and Accotink Creek floodplains and consist of a variable mix of pin oak (*Quercus palustris*), willow oak (*Quercus phellos*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), red maple, river birch (*Betula nigra*), and sweet gum. The understory contains highbush blueberry (*Vaccinium corymbosum*) (Paciulli, Simmons and Associates, Ltd., 1998).

Poorly drained hardwood forests differ from moderately well-drained hardwood forests in that they are located on wetter soils and are dominated by hydrophytic vegetation. Moderately well-drained floodplain hardwood forests are located within drier soils and are mixed with hydrophytic and non-hydrophytic vegetation. Poorly drained floodplain hardwood forests are usually jurisdictional wetlands under Section 404 of the Clean Water Act.

Non-Tidal Marsh/Beaver Pond Community

Non-tidal marsh/beaver pond areas are successional herbaceous to scrubby wetlands of variable composition. They consist of emergent wetlands that are above the tidal limits of Accotink Creek and Pohick Creek, and emergent wetlands within Jackson Miles Abbott Wetland Refuge along Dogue Creek. Large areas of emergent wetlands border the braided channels within Pohick Creek's floodplain and above the tidal influence. Many of these areas are created or influenced by beaver activity that has caused flooding and created open marshes in areas previously dominated by hardwood forests. Beavers have created a large marsh along Poe Road. Vegetation composition is variable, consisting of emergents including arrow arum (*Peltandra virginica*), rice cutgrass (*Leersia oryzoides*), sedges (*Carex* sp.), rushes (*Juncus* sp.), smartweeds (*Polygonum* sp.), and swamp rose mallow (*Hibiscus moscheutos*). Common shrubs are buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), and swamp dogwood (*Cornus amomum*) (Paciulli, Simmons and Associates, Ltd. 1998). The beaver pond complexes at Fort Belvoir support two state-rare damselfly species: the sphagnum sprite and the furtive forktail (*Ischnura prognata*). The state rare least bittern (*Ixobrychus exilis*) has been known to use marshes in the Dogue Creek wetlands (Hobson, 1996).

Tidal Marsh Community

Tidal marshes dominate shallow tidal areas of Accotink and Pohick Creeks, and also occur at the mouths of several streams that flow from Fort Belvoir into surrounding tidal waters. Tidal marsh consists of a

variable mix of emergent wetland vegetation such as arrow arum, yellow pond lily (*Nuphar luteum*), pickerelweed (*Pontedaria cordata*), wild rice (*Zizania aquatica*), cattail (*Typha latifolia*), and river bulrush (*Scirpus fluviatilis*) (Paciulli, Simmons and Associates, Ltd., 1998).

The fresh tidal marsh at the mouth of Accotink Creek is an area of semipermanently flooded herbaceous vegetation, which has been identified as a significant community. It represents a community type that is fairly uncommon in Virginia. This community is in good to excellent condition with little evidence of disturbance and is one of the better examples of its type in Virginia. Several rare plant species, including vetchling (*Lathyrus palustris*), water-plantain spearwort (*Ranunculus ambigens*), and river bulrush (*Scirpus fluviatilis*) occur within this community at the head of Accotink Bay. The watchlist plant species large bur-reed (*Sparganium eurycarpum*) and creeping spikerush (*Eleocharis smallii*) also occur within this community (Hobson, 1996).

Freshwater Tidal Swamp Forest Community

Freshwater tidal swamp forests are tidally influenced palustrine forests. At Fort Belvoir, the dominant trees are green ash and red maple. The understory composition is variable, and influenced by the extent of tidal flooding and openness of the canopy. Typical shrubs in less inundated areas include highbush blueberry, arrowwood viburnum, and silky dogwood (*Cornus amomum*) in areas less inundated. Areas that have an open canopy and are semi-permanently to permanently flooded have an understory that includes typical broadleaf emergents such as arrow arum, yellow pond lily (*Nuphar luteum*), and pickerelweed that occupy adjacent tidal marshes (Paciulli, Simmons and Associates, Ltd., 1998).

Two significant areas of tidal swamp forest occur as peninsulas that extend into Gunston Cove. Tidal forests are also located along the upper tidal limits of Accotink Bay.

Tidal Scrub/Shrub Wetland Community

Tidal scrub/shrub wetlands at Fort Belvoir are the least dominant tidal vegetation community and are generally located along the edges of tidal swamp forests near the transition to tidal marsh. They are tidally influenced palustrine scrub/shrub wetlands dominated by woody plants less than three inches in diameter at breast height, but greater than 3.2 feet in height. Tidal scrub/shrub vegetation at Fort Belvoir consists of black willow (*Salix nigra*), red maple, common alder (*Alnus serrulata*), and green ash (Paciulli, Simmons and Associates, Ltd., 1998).

Old Field Grasslands

In the Mid-Atlantic region, old field grasslands generally are abandoned fields and clearings that are still in early successional stages. At Fort Belvoir, they generally consist of unimproved open fields or areas that are infrequently mowed. Old field grasslands occur in areas previously cleared for landfills, farming, and training. Approximately 190 acres of grasslands and potential grasslands have been identified at Fort Belvoir. They range in size from less than one-half acre to more than 20 acres (Paciulli, Simmons and Associates, Ltd., 1996). Old field grasslands do not include grounds such as golf course roughs since they tend to be landscaped and mowed occasionally. Dominant vegetation consists of a variable mix of grasses and wildflowers (forbs). Characteristic species are broomsedge (*Andropogon virginicus*), tall fescue (*Festuca elatior*), and bushclover (*Lespedeza cunneata*). These areas are valuable for providing habitat for song birds, ground nesting birds, and small mammals, which provide food sources for wildlife such as fox and birds of-prey (Paciulli, Simmons and Associates, Ltd., 1998).

Urban Land

All developed areas at Fort Belvoir are identified as urban land. Urban land consists of improved and semi-improved grounds. This includes open lands, natural tree stands and woodland borders, buildings and paved areas, turf and landscaped areas. Open areas such as the airfield and golf courses are considered urban land. The vegetation is characterized by a wide variety of native trees, planted landscape trees and shrubs, tall fescue grass, and Kentucky bluegrass (*Festuca arundinacea*) (Paciulli, Simmons and Associates, Ltd., 1998). Vegetation management of developed lands is presented in the following chapter 10.0 Developed Areas.

Appendix G

Wildlife Hazard Management Plan

U.S. Army Garrison Fort Belvoir
Davidson Army Airfield

Wildlife Hazard Management Plan (WHMP)

U.S. Army Garrison Ft. Belvoir
Davison Army Airfield (DAAF)

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ACRONYMS AND ABBREVIATIONS

AAAS	Army Airfield Automation System
AC	Airfield Circular
AF Pam	Air Force Pamphlet
AFSO	Airfield Safety Officer
AR	Army Regulation
ASO	Aviation Safety Officer
AHAS	Avian Hazard Advisory System
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
BAM	Bird Avoidance Model
BASH	Bird/Wildlife Aircraft Strike Hazard
BBS	Breeding Bird Survey
BWC	Bird Watch Condition
CBC	Christmas Bird Count
DA Pam	Department of the Army Pamphlet
DAAF	Davison Army Airfield
DCA	Ronald Reagan Washington National Airport
DES	Directorate of Emergency Services
DoD	Department of Defense
DPW	Directorate of Public Works
ENRD	Environmental and Natural Resources Division
FAA	Federal Aviation Administration
FOD	Foreign Object Debris
GIS	Geographic Information System
IAW	In Accordance With
IJO	Internal Job Order
ILS	Instrument Landing System
ISSA	Installation Services Support Agreement
IMCOM	Installation Management Command
MBTA	Migratory Bird Treaty Act
MFR	Memorandum for Record
NEXRAD	Next Generation Radar
NOTAM	Notice to Airmen
PAO	Public Affairs Office
PIF	Partners in Flight
POC	Point Of Contact
PPE	Personal Protective Equipment
UFC	Unified Facilities Criteria
USAF	United States Air Force
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WDDT	Wildlife Detection and Dispersal Team
WHMP	Wildlife Hazard Management Plan
WWG	Wildlife Working Group

SECTION 1
Introduction

1-1. Purpose

This plan is designed to minimize the potential of a bird/wildlife strike to aircraft. There is no single solution that can accomplish this goal. Therefore, an integrated approach of techniques and entities is considered in the overall WHMP. This plan is designed to:

a. Establish a WWG and designate responsibilities to its members.

b. Establish procedures for reporting hazardous bird/wildlife activity and altering or discontinuing flying operations. Reporting should be a collective effort between all air and ground personnel operating in the airfield environment.

c. Establish procedures to identify high hazard situations and to aid supervisors and aircrews in disseminating information, issuing alerts, and altering or discontinuing flying operations when required.

d. Establish active/passive techniques to disperse bird/wildlife from the airfield and decrease airfield attractiveness to bird/wildlife.

e. Establish procedures to eliminate or reduce environmental conditions that attract bird/wildlife to the airfield.

f. Identify organizations with authority to initiate or terminate Bird Watch Conditions.

1-2. Background

Bird strikes have been occurring almost since the beginning of powered flight. Calbraith Rodgers, the first man to fly across the U.S., was also the first to die as a result of a bird-aircraft collision. On April 3, 1912, Rodgers' Wright Pusher struck a gull, causing the aircraft to crash into the surf at Long Beach, California. Rodgers was pinned under the wreckage and drowned.

a. No airfield or aircraft type is immune from the hazards of bird/wildlife-aircraft strikes. Both birds and mammals have been involved in damaging aircraft strikes; this document will concentrate on airfield bird/wildlife hazards and their management. Birds/wildlife pose a serious hazard to Army airfields and aviation. A flock of birds suddenly rising up from a runway or surrounding area may collide with aircraft, resulting in damage to the aircraft, or in extreme cases, causing the plane to crash.

b. The Federal Aviation Administration (FAA) says there were about 65,000 bird strikes to civil aircraft in the United States from 1990 to 2005, or about one for every 10,000 flights. Since 1960 more than 25 large aircraft crashes were caused by bird strikes. In 23 of these incidents, the strike occurred below 400 feet.

c. The civil and military aviation communities widely recognize that the threat to human health and safety from aircraft collisions with aircraft-bird/wildlife strikes is increasing. Globally aircraft bird/wildlife strikes have killed more than 194 people and destroyed over 163 aircraft since 1988.

d. It is impossible to avoid all bird/wildlife strikes, but actions can be taken to minimize the potential of a strike. First, by examining leading indicators that are correlated with mishap risk (e.g., wildlife populations, near-misses, engine damage and reported strikes) potential unsafe situations can be identified and avoided. Second, passive and active wildlife management techniques can be implemented to directly affect wildlife in and around the airfield.

e. The goal of the WHMP is to reduce the man/bird/wildlife conflict, while maintaining the varied wildlife populations and habitats for the benefit and enjoyment of the people.

f. Terms used throughout this draft are located and defined at Appendix A.

1-3. Airfield Description

a. Davison Army Airfield (DAAF), Fort Belvoir, VA. (Appendix B)

b. Airfield size- 500 acres

c. Airfield Elevation- 73 feet

d. General topography.

(1) Significant Terrain Features- Uneven surfaces are located within the airfield environment. These uneven surfaces serve as drainage ditches for the airfield.

(2) Water areas within DAAF boundary- A 10 acre wetland exists in the northwest corner, a 2 mile section of Accotink Creek runs northwest to southeast one quarter mile to the east (Appendix C).

(3) Water areas outside of DAAF boundary- a 6 acre storm pond exists within a housing development .25 miles west, and a 2.5 acre storm pond exists one mile to the east. Accotink and Pohick Creeks, which then flow into Accotink and Pohick Bays, are located one and two miles south respectively, which flow into Gunston Cove and then the Potomac River approximately 3 miles south of DAAF (Appendices B and C).

(4) Developed areas within DAAF boundary- a 42 and 27 acre office and airfield operations complex exist to the west and east of runway 14/32 respectively, and a 12 acre office facility exists along the eastern boundary (Appendix C).

(5) Developed areas outside of DAAF boundary- a 68 acre residential housing development exists .3 miles to the southwest, a 107 acre industrial complex .4 miles to the northwest, a 400 acre industrial complex one mile to the north, a 250 acre residential housing development .6 miles to the northeast, a 75 acre waste treatment facility with a 2.5 acre sewage pond 1.52 miles to the southwest, and a 3300 acre military office complex, which is part of Fort Belvoir, .9 miles to the east and 1.75 miles to the southeast (Appendices B and C).

(6) Undeveloped areas within DAAF boundary- a 300 acre forested stream and wildlife corridor is located to the east along Accotink Creek, and 12 and 33 acre forested areas exist within the perimeter fence of DAAF (Appendix C).

(7) Undeveloped areas outside of DAAF boundary- a 2500 acre forested area containing military training, ranges, and a wildlife refuge is located directly to the south, a 160 acre forested wildlife corridor to the east along Accotink Creek, 70 acre forested tract to the west, and a 200 acre forested stream corridor to the northwest (Appendix C).

(8) Vegetative types within DAAF boundary- upland and lowland hardwood species (52 acres), with several small interspersed pockets of pines (20 acres). The runway is surrounded by approximately 155 acres of grassland (Appendix D).

(9) Landfill locations- a 170 acre active landfill owned by Fairfax County is located 3 miles to the southwest, 3 inactive landfills exist to the south and are 19, 21, and 32 acres in size. All 3 inactive landfills are capped, covered with vegetation, and monitored regularly for environmental compliance (Appendices B and C).

(10) Sewage ponds- a 2.5 acre sewage pond exists on a Fairfax County Waste Treatment Facility located 1.4 miles to the southwest (Appendix B).

(11) Golf course- a 600 acre golf course with a 2 acre pond exists .25 miles to the northeast, and a 215 acre golf course with a 3 acre pond exists 2.25 miles to the southwest (Appendix B).

(12) Other bird/wildlife attractions- several small stormwater ponds exist throughout the surrounding area (Appendix C).

1-4. Conditions of Execution

This plan is based on hazards posed by both resident and seasonal bird/wildlife populations. Portions of this plan must be implemented on a continuous basis, while others will only require implementation in the event of increased bird/wildlife activity. Increased bird/wildlife activity is usually associated with the arrival of migratory species.

a. REFERENCES.

AR 95-2	Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control, and Navigational Aids
AR 385-10	The Army Safety Program
DA Pam 385-40	Army Accident Investigations and Reporting
DA Pam 385-90	Army Aviation Accident Prevention Program
UFC 3-260-01	Airfield and Heliport Planning and Design
AC 150/5200-36A	Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazard on Airports.
AC 150/5200 33B	FAA Advisory Circulars Hazard Wildlife Attractants on or near Airports
AFP 91-212	BASH (Bird Aircraft Strike Hazard) Management Techniques

SECTION 2
Organizational Tasks and Responsibilities

2-1. Airfield Hazard Assessment and Recommendations

DAAF Airfield Services are responsible for ensuring that airfield vegetation, fencing, and drainage are managed to minimize bird/wildlife attractants. DAAF will be responsible for identifying projects and Fort Belvoir Directorate of Public Works (DPW) will be responsible for development, implementation, and overseeing of the project. An excellent cooperative relationship must exist among all installation agencies to ensure proper environment exists.

a. Airfield Turf.

DPW Base Operations Contractor will maintain airfield turf in accordance with (IAW) the DAAF Mowing Plan Standard Operating Procedure which is a joint agreement between DAAF and Directorate of Public Works- Environmental and Natural Resources Division (DPW-ENRD) see Appendices E and F. DAAF Airfield Services will submit a service order request to DPW Base Operations Contractor if maintenance is required outside of the regularly scheduled maintenance.

b. Bare Areas.

Defined as those areas without grass that must be filled with appropriate landscaping resources expeditiously to avoid the chance of becoming a wildlife attractant. DAAF Airfield Services will submit a service order request to the DPW Base Operations Contractor or Internal Job Order (IJO) to DPW depending upon cost, to plant grass, after which the DPW Base Operations Contractor will be responsible for maintaining.

c. Drainage.

DAAF Airfield Management will monitor drainage during daily airfield inspections/checks. DPW Base Operations Contractor will maintain the drainages to reduce the risk of impeded flow such as trash or vegetation. Airfield Management will report drainage discrepancies/issues to DPW and monitor until corrective actions are complete. Airfield Management will submit an IJO to DPW who will be responsible for correcting if an IJO is required.

d. Security Fencing.

Airfield Management will perform a visual check of security fencing during daily airfield inspections/checks. Airfield Management will report security fencing discrepancies/issues to the DAAF Anti-Terrorism Officer and DPW and monitor until corrective actions are complete.

e. Trees and Landscaping.

Airfield Management will perform a visual check of trees and landscaping surrounding the airfield environment during daily airfield inspections/checks. Airfield Management will report tree and landscaping discrepancies/issues to DPW and monitor until corrective actions are complete.

f. Perch and Nest Sites.

DAAF Airfield Division and tenant units will report known perch and nest sites to DPW-ENRD for consultation and approval of appropriate action. DAAF Airfield Division and tenant units are not to disturb active or inactive bird nests.

g. Waste Management.

All garbage and other wastes that could be attractive to birds or wildlife are to be stored only in enclosed containers until collected and removed. DAAF Airfield Services are responsible for assuring construction containers as well as public trash containers are to be covered to limit access by birds and other wildlife to wastes.

h. Wildlife Attractants.

DPW-ENRD will notify DAAF Airfield Management regarding wildlife attractants and will recommend removal/reduction when appropriate. DAAF Airfield Management will perform a daily visual check for all situations and activities that may serve as a wildlife attractant and notify DPW-ENRD for advice. DAAF Airfield Division and tenant units are not to handle birds and wildlife unless in the event of a strike. See section 2-3b(6) for instructions and guidance.

i. Buildings

Airfield Services are responsible for managing of buildings, structures, and hangars. DPW is responsible for maintaining all buildings including hangars.

2-2. Wildlife Working Group

The WWG is organized to implement and monitor the WHMP.

a. Authority.

(1) The DAAF Airfield Manager or designated representative is the WWG Chairman, responsible for the WHMP and is the approval authority for all WWG recommendations.

(2) The WHMP is a part of the Airfield Safety and Accident Prevention Program, and as such, the Airfield Safety Officer (AFSO) shall monitor the effectiveness of the Plan.

(3) At minimum, the WWG will consist of the following personnel:

Airfield Manager
Airfield Safety Officer (AFSO)
Air Traffic Control (ATC) representative
Airfield Management Specialist Supervisor
Airfield Services Manager
Airfield ATC Maintenance Supervisor
DPW representative
DPW-ENRD representative
Flying organization Aviation Safety Officer (ASO) representatives
Aircraft Maintenance (as applicable)

(4) WWG meetings will be scheduled semi-annually, or more frequently as required. Meeting minutes will be recorded, maintained, and distributed by the AFSO.

b. WWG Function.

(1) Execute the WHMP and update/review the WHMP on an annual basis or more frequently if appropriate.

(2) Monitor compliance with the WHMP.

(3) Collect, compile, and review trend data on all bird/wildlife strikes, Bird Watch Condition (BWC) changes, and bird/wildlife dispersal activities on or near the airfield.

(4) Identify and recommend actions to reduce the bird/wildlife hazards.

(5) Recommended changes in operational procedures and airfield environment.

(6) Prepare informational programs and safety briefings for aircrews.

(7) Recommend modifications to the program to improve effectiveness.

2-3. Responsible Parties Within DAAF

DAAF is a tenant of Ft. Belvoir and has an ISSA (Installation Services Support Agreement) with Ft. Belvoir. Ft. Belvoir has a base operations contract such that most maintenance and other activities are handled through the contractor. Ft. Belvoir does have several directorates (DPW, DES, DPTMS etc…) that oversee different program areas and operations.

a**.** Airfield Manager

(1) Chairs the WWG or appoints a designated representative.

(2) Publishes minutes of WWG meetings.

(3) Approves recommendations of WWG.

(4) Declares a BWC based on BWC criteria IAW this plan and recommendations from Airfield Management Operations/ATC. Note: If the Airfield Manager is absent the Airfield Management Operations personnel are appointed as representatives to designate and declare an appropriate BWC.

(5) Ensures bird/wildlife hazard warnings on the airfield are disseminated IAW this plan.

(6) Provides guidance to airfield personnel on the reporting of BWC and bird/wildlife strikes to aircraft.

(7) Issues specific guidance to Airfield Management Operations personnel on procedures to be followed under each BWC.

(8) Makes operational changes to avoid areas and times of known hazardous bird/wildlife concentrations, mission permitting.

(9) Appoints the Wildlife Detection and Dispersal Team (WDDT), to be made up of DAAF employees, and determines when and where members respond, consistent with the requirements of this Plan.

(10) Ensures all members of the WDDT are properly trained by DPW-ENRD for the handling of injured birds/wildlife and birds/wildlife carcasses/remains.

(11) Acquires, maintains, and oversees use/operation of dispersal equipment. See Appendix G for a description of this equipment.

(12) Ensures all members of the WDDT are trained on all dispersal equipment.

(13) Identifies maintenance work requests and defends funding for execution.

b. Airfield Safety Officer (AFSO)

(1) Monitors compliance with the WHMP.

(2) Assembles and disseminates bird/wildlife data to WWG and aviation units to include information on how each unit may obtain predictive bird/wildlife hazard information using the USAF Bird Activity Model (BAM), (Appendix H).

(3) If required by flying organizations/activity, post a current prediction of bird/wildlife activity hazards based on the USAF BAM and DPW-ENRD recommendations/assessments on the WHMP Bulletin Board in Airfield Management Operations.

(4) Monitors bird/wildlife activity and strike statistics and advises the WWG chairperson when additional meetings are deemed necessary.

(5) Controls a WHMP hazard education program to include films, posters and information on local bird/wildlife hazards and reporting procedures. Note: This material and reporting procedures are located and maintained in Airfield Management Operations.

(6) Coordinates DPW-ENRD directions with aircrews (Aviation Safety Officers) and maintenance personnel regarding the collection of animal parts after strikes.

(7) Establishes and maintains a continuity folder with pertinent bird/wildlife data and information to assure continuity of knowledge with personnel turnover.

(8) Creates a WHMP Bulletin Board in the Flight Planning Room and develops an airfield bird/wildlife activity map tailored to local bird/wildlife hazards with assistance from DPW-ENRD. Posts, disseminates, and updates map, as appropriate. At a minimum, map will be reviewed annually and will include the date of publication/review.

(9) Ensures all personnel are trained and equipped with personal protective equipment (PPE) and monitored to conduct any bird/wildlife control activities.

(10) Receives FAA Form 5200-7 (Appendix I) from Aircrew and maintains all strike reports on file for five years.

c. Air Traffic Control (ATC)

(1) Reports observed bird/wildlife activity to Airfield Management Operations and pilots, as required.

(2) Issues BWC advisories to aircrews as required.

(3) Identifies radar targets as possible bird activity when appropriate to provide warnings to pilots.

(4) Recommends missed approaches/go arounds or delayed takeoffs when possible bird/wildlife hazards appear on ATC radar or are visually observed.

(5) Under bird watch condition SEVERE, ATC will broadcast the appropriate advisory information to all pilots and provide them with the option to delay, divert, or continue the proposed operation into the hazardous area.

(6) Makes appropriate operational changes to avoid areas of known hazardous bird/wildlife concentrations, mission permitting. Consider the following during periods of increased bird/wildlife activity;

(a) Limit or prohibit formation takeoffs and landings.

(b) Limit time on traffic pattern routes to minimum for training requirements.

(c) Split formation during recovery.

(d) Discontinue formation instrument approaches.

d. Airfield Management Operations

(1) During daily airfield inspections and checks- observe, report, and disperse bird/wildlife on or near the airfield. Personnel may only disperse non-nesting birds or wildlife. If the situation involves active bird or wildlife nests, airfield staff must contact DPW-ENRD for action.

(2) Based upon observation or reports of bird/wildlife activity, declare/recommend a BWC to the Airfield Manager.

(3) Post the current BWC on the AAAS (Army Airfield Automation System) in the flight planning room for aircrews and transient personnel to see. Note: A Notice to Airmen (NOTAM) will be posted if the BWC warrants one.

(4) Report bird/wildlife strike incidents, hazards, and BASH related activities to Airfield Manager, AFSO, and DPW-ENRD.

(5) Procures and maintains approved, nonlethal bird/wildlife dispersal equipment and bird/wildlife identification books.

(6) Contacts DPW-ENRD after a strike occurs to coordinate collection of birds/wildlife carcasses/remains and/or living birds/wildlife.

Note: *In the event that a strike occurs, only WDDT personnel trained in collection and handling of injured birds/ wildlife or bird/wildlife carcasses/remains, DPW-ENRD, and the DPW-ENRD Pest Management Contractor may proceed with collection and/or handling of injured birds/wildlife or birds/wildlife carcasses/remains. All carcasses and remains will be placed in a sealed plastic container for retrieval by DPW-ENRD. No personnel may have carcasses or remains of birds and/or wildlife in their possession after disposing of in the sealed plastic container. Any injured birds/wildlife that are collected/handled and are still alive must be placed in a reasonable sized container until DPW-ENRD or DPW-ENRD directed Pest Management Contractor can respond. DAAF*

personnel may not euthanize/dispatch any bird and/or wildlife at any time. DPW-ENRD may also direct the Pest Management Contractor to retrieve remains for appropriate disposal.

(7) Coordinates DPW-ENRD directions, when applicable, with aircrews (Aviation Safety Officers) and maintenance personnel regarding the collection of animal parts after strikes.

(8) Establishes and maintains a continuity folder with pertinent bird/wildlife data and information to assure continuity of knowledge with personnel turnover.

(9) Ensures all personnel are trained, equipped with personal protective equipment (PPE) and monitored to conduct any bird/wildlife control activities.

(10) Maintains records of bird/wildlife hazardous incidents, strikes, and dispersal activities to include action taken, dates, times, and prepares monthly report for DPW-ENRD.

e. Wildlife Detection and Dispersal Team (WDDT)

(1) The WDDT is selected by the Airfield Manager and includes DAAF personnel authorized to employ non-lethal deterrent and dispersal techniques when necessary. Dispersal activity by the WDDT is limited to non-nesting birds and wildlife only. The WDDT is to contact DPW-ENRD for nesting birds and wildlife. All members of WDDT will have documented training on the following (initial and recurring (every two years) training):

(a) Species identification

(b) Wildlife active/passive control techniques

(c) BWC identification, reporting and downgrading

(d) Safe handling and collection of bird/wildlife remains or living birds/wildlife.

(2) All new and current personnel assigned to the WDDT will be trained by a DPW-ENRD Natural Resource Specialist.

(3) The WDDT will be vigilant at all times to allow for immediate action when bird/wildlife on the airfield creates hazardous conditions. WDDT personnel must have immediate access to binoculars and wildlife dispersal/removal equipment.

(4) A daily log must be maintained for all dispersal activities and submitted to Airfield Management Operations.

f. Airfield Services

(1) Are responsible for coordinating all maintenance activities to include but not limited to grass mowing, fence repair, removal/reduction of perches and nest sites, removal of wildlife attractants, turf maintenance, drainage ditches, trash collection and removal, etc…

(2) Maintenance activities will be coordinated by DAAF Personnel, DPW Operations and Maintenance, DPW-ENRD, and the current Base Operations Contractor.

2-4. Responsible Parties Outside of DAAF Airfield Division

a. Aircrew- those personnel who fly and operate aircraft.

(1) Bird/wildlife hazards should be considered and incorporated into the mission planning and briefing process. This would include applicable bird advisories and hazard information, available through Internet sources, Automated Terminal Information System (ATIS), or as disseminated locally. Internet sources include predictive bird

hazard information using the USAF BAM. See Appendix H for more information about BAM.

(2) Aircrews are essential to detecting bird/wildlife hazards on the airfield and in the local flying area. When aircrews sight birds/wildlife, they should notify other aircrews, ATC, and AFSO. Aircrews may also help ATC personnel remain aware of bird/wildlife hazards by requesting bird/wildlife hazard information before takeoff and landing. These requests remind ATC to be alert for birds/wildlife when authorizing aircraft movements.

(3) Aircrews are responsible for reporting aircraft strikes to Airfield Management Operations. FAA Form 5200-7, Bird/Other Wildlife Strike Report (Appendix I) will be used. Upon completion, units will submit the FAA Form 5200-7 to the AFSO or Airfield Management Operations.

(4) Strike reports will be kept on file by AFSO for a minimum of five years.

b. Flying Organization

(1) Each flying organization on the airfield will assign a Point of Contact (POC) and alternate to represent the organization during the Garrison WWG and to retrieve/disseminate information when needed.

(2) At a minimum, annually brief aircrews to promptly report all bird/wildlife strikes and hazardous conditions per this directive.

(3) Ensure aircrews are able to obtain current activity data and bird/wildlife condition status.

(4) Ensure that the current bird/wildlife activity data is available and briefed for each planned phase of flight.

(5) Ensure that an adequate supply of bird/wildlife report forms and bird/wildlife activity maps are readily available for aircrews. Bird/wildlife activity maps will be provided by the AFSO.

(6) Unit Safety Officers will brief aircrews on seasonal bird/wildlife hazards. Movies, articles, and other information will be used, as appropriate, to maintain awareness.

c. Directorate of Public Works (DPW).

Modifies facility conditions to reduce wildlife hazards as recommended by the WWG, contingent upon the availability of funding and the appropriate plans/designs are provided and approved.

d. Directorate of Public Works, Environmental and Natural Resources Division (DPW-ENRD).

(1) Advises Airfield Manager, WWG, and Airfield Services on wildlife biology and behavior, habitat requirements or modifications, or management schemes to make informed decisions and minimize aircraft-wildlife strikes.

(2) Advises or assists DES on all lethal taking of wildlife pursuant to wildlife activities.

(3) Controls the contract for pest control services.

(4) Depredates nuisance species in coordination with DES.

(5) Identifies remains of all dead wildlife when possible and ensures proper disposal of remains pursuant to applicable federal and state permits and requirements.

(6) Maintains all records and reports of bird/hazardous wildlife sightings and incidents, and prepares annual report.

(7) Acquires and maintains all state/federal permits for non-game species, as necessary.

(8) Files the records of animals harvested under the non-game species permit with appropriate state and federal agencies for the permits held by DPW-ENRD.

(9) Trains all appropriate current and newly employed DAAF WDDT personnel on appropriate collection and handling of injured birds/wildlife and birds/wildlife carcasses/remains.

(10) Provides contact information of current DPW-ENRD Natural Resources Specialists and Branch Chief to DAAF Personnel.

e. Public Affairs Office (PAO).

(1) Provides Command Information, Community Relations and Media Relations in support of the WHMP for DAAF. Such support will inform target audiences and constituencies of the plan and its objectives.

f. Directorate of Emergency Services (DES).

(1) Conducts depredation of nuisance birds/wildlife in coordination with DPW-ENRD.

(2) Assists with dispersal of birds/wildlife when necessary.

SECTION 3
WHMP Operations

3-1. General

The WHMP program management is an ongoing process, which includes both information dissemination and active/passive bird/wildlife control techniques.

3-2. Authority

The Airfield Manager or his designated, on duty Airfield Management Personnel representative, has the authority to declare a bird watch condition during normal flight operations. This person can declare conditions based on ground observations, pilot reports, radar observations, etc.

3-3. Bird Watch Warning System

The Bird Watch Warning System is one of the most critical WHMP procedures as it is an immediate exchange of information between ground agencies and aircrews concerning the existence and location of bird/wildlife that pose a hazard to flight safety.

a. Bird Watch Conditions (BWC).

The following BWC's will be used at DAAF to warn aircrew and support personnel of the current bird/wildlife threat to operations. These codes are identical to those used by the USAF. Bird/wildlife locations should be given with the condition code. The Airfield Manager or designated representative will make the final determination on BWC's.

(1) BWC SEVERE. Generally defined as a heavy concentration of more than 15 large or 30 small birds/wildlife, on or immediately adjacent to the active runway or other specific locations that present an immediate hazard to flying operations.

(a) Aircrews must thoroughly evaluate mission need before operating in areas under condition SEVERE.

WARNING: Landing or departing in condition SEVERE may result in aircraft damage from a bird strike.

(b) SEVERE may also be declared when birds/wildlife of any size or quantity, present an immediate hazard. Active dispersal will be initiated during this condition and applicable Go/No-Go restrictions applied. Note: Each flying unit shall establish Go/No-Go restrictions for their respective organizations.

(2) BWC MODERATE. Generally defined as concentrations of 5-15 large or 15-30 small birds/wildlife, on or near the active runway or other specific locations representing increased potential for strikes. BWC MODERATE requires increased vigilance by all agencies and supervisors, and caution by aircrews.

(3) BWC LOW. Bird/wildlife activity on and around the airfield representing low potential for strikes.

Note: *The ATC Tower may determine if bird/wildlife activity away from the primary runway constitutes a threat to flying operations. If it does not, the ATC Tower or the Airfield Manager's designated representative may lower the BWC for the primary runway while keeping the higher BWC for the other area.*

b. BWC Reporting.

Declaration of a BWC will be made by the Airfield Manager or designated representative based on the following:

(1) Visual observation of bird/wildlife activity on or near the airfield by ATC Tower, Airfield Services, or WDDT personnel.

(2) Information relayed by ATC radar, airborne and taxiing aircraft.

(3) Observations relayed to the ATC Tower.

c. BWC Declarations by Maintenance Personnel, Sweepers, Grass Mowers, and Others.

If a bird/wildlife hazard exists, other personnel shall notify DAAF Airfield Management Operations personnel, as applicable. This notification can be made on a radio net or by telephone. All reports will be verified either by ATC Tower or Airfield Management Operations/Flight Dispatch personnel. Reports should include:

(1) Identity of caller (agency for ground personnel, call sign for aircrews).

(2) Location.

(3) Altitude.

(4) Time of sighting.

(5) Approximate number of bird/wildlife.

(6) Type of bird/wildlife (if known).

(7) Behavior of bird/wildlife (soaring, flying to or from a location, etc).

d. Bird Hazard Communication.

Disseminating BWC is critical to WHMP effectiveness. ATC Tower communications will disseminate BWC by the following means:

(1) Include BWC on ATIS Broadcasts.

(2) Notify inbound/departing aircraft of BWC if aircraft has received ATIS and BWC has changes.

(3) Provide additional bird/wildlife advisories.

(4) The ATC Tower Supervisor or Controller in charge will direct the WDDT to the location where the wildlife is posing a problem.

(5) Pass BWC to Airfield Management Operations if notified by some other entity.

(6) For rapidly changing BWC place a statement on ATIS advising aircrew to contact Airfield Management Operations or ATC Tower for the latest BWC.

(7) ATC will broadcast the appropriate advisory information to all pilots and provide them with the option to delay, divert, or continue the proposed operation into the hazardous area.

(8) Records of all BWC conditional changes will be reported to all members of the WWG.

e. Downgrading BWC.

Once a BWC has been declared, it shall be downgraded commensurate with updated information. The Airfield Manager or designated representative will make the final determination on BWC's.

3-4. Wildlife Detection Dispersal Team Procedures

WDDT will actively patrol DAAF and use appropriate active deterrence methods that do not harm or injure birds and/or wildlife. Dispersal activities are not authorized if a bird or wildlife is nesting. WDDT will contact DPW-ENRD for nesting birds or wildlife. WDDT WILL NOT EXECUTE LETHAL CONTROL. See Appendix G for WHMP dispersal equipment and methods available.

a. General Dispersal Guidelines.

(1) Prior to initiation of dispersal actions the WDDT team leader will coordinate the location and methods with ATC and ensure the appropriate BWC has been declared prior to dispersal activities on the active runway.

(2) Vehicle horns and sirens can be used initially to harass non-nesting birds/wildlife; however this method is the least effective method at moving the birds/wildlife off the airfield. Normally, once the birds are airborne or wildlife is running from the sound of the horn/distress tapes, the use of pyrotechnics will move the birds/wildlife a further/safer distance from the airfield.

(3) Horns and bioacoustics distress calls shall be used before pyrotechnics are used.

(4) Pyrotechnics can be used in conjunction with distress tapes. These consist of screamer, whistle banger and cracker shells. No pyrotechnics may be used without Garrison Commander and Installation approval.

(5) Propane sound cannons will be placed around the airfield and moved periodically (once a week) to prevent habituation.

(6) All non-lethal deterrents must be attempted first before contacting DPW-ENRD for depredation by DES and/or DPW-ENRD.

(7) If the general dispersal methods above are attempted and inaffective, or the bird/wildlife become accustomed to the hazing, the need to remove bird/wildlife via lethal methods to reinforce the dispersal methods will be determined by DPW-ENRD.

(8) Lethal taking of bird/wildlife will be carried out by DES-Game Warden and DPW-ENRD. All lethal methods will be coordinated between DES-Game Warden, DPW-ENRD, and DAAF.

(9) Some methods require immediate attention while others will be deployed during specific times of day and year dependent upon urgency and DAAF activities/operations. DPW-ENRD and/or Pest Management Contractor will collect all bird/wildlife for identification, disposal, and reporting requirements.

(10) When the target flock, problem bird(s), or other wildlife are dispersed, Airfield Management Operations shall be notified so the BWC can be lowered.

b. Record-keeping.

(1) Depredation of any birds or other wildlife is to be done only by DPW-ENRD (or the DPW Pest Control Contractor) or DES Game Warden, and shall be recorded and reported IAW the state/federal permit requirements.

(2) Collection and disposal of carcasses is to be done by DPW-ENRD (or the DPW Pest Control Contractor). State/federal permits are required for conducting depredation.

(3) Airfield Management Operations will maintain a daily activity log to include bird/wildlife sightings and WDDT activities.

(4) These logs will document all bird/wildlife dispersal operations to include species, location, methods, and number of birds dispersed.

(5) Monthly data will be summarized for WWG, Airfield Safety, and FOD Council Meetings.

(6) Dispersal by airfield staff or tenants is limited to non-nesting birds/wildlife. DPW-ENRD is to be called for situations involving nesting birds or wildlife.

3-5. Land Management Procedures

One of the most effective and permanent methods of discouraging bird/wildlife from using the airfield is the removal of attractive habitat features. Land management activities are handled on a case-by-case basis through the WWG. See Appendix J, Passive WHMP control methods.

SECTION 4
Strike Reporting

4. Bird/Wildlife Strike Reporting

Reporting of bird/wildlife aircraft strikes is an essential part of the WHMP program.

After a strike.

(1) The pilot should inform the DAAF ATC tower of any bird/wildlife strike and if airborne, land to assess the damage.

(2) If the strike occurs on the ground the pilot should stop the aircraft to assess the damage.

Note: *Report known or suspected strikes even if no bird/wildlife remains or injured birds/wildlife are found on the aircraft. Airfield Management Operations, WDDT, DPW-ENRD, and/or Pest Management Contractor personnel may be able to retrieve the injured birds/wildlife and/or birds/wildlife carcasses/remains on the airfield.*

(3) After assessing the aircraft for damage, the pilot should notify Airfield Management who will coordinate the collection and retrieval of injured birds/wildlife or bird/wildlife carcass/remains. Aircrews are not permitted to handle injured birds/wildlife or birds/wildlife carcasses/remains or dispatch/euthanize any birds/wildlife.

(4) Aircrews are responsible for reporting the strike by filling out FAA Form 5200-7 Bird/Other Wildlife Strike Report (Appendix I) which is available at Airfield Management Operations.

(5) After filling out the form give it to the AFSO and Airfield Management Operations.

(6) Strike reports will be kept on file by AFSO for five years.

(7) If an aircraft is damaged the Unit ASO will be informed and an accident investigation will be performed IAW DA Pam 385-40.

SECTION 5
Summary of Recommendations

5. Summary
Airfield Management Operations, Airfield Services, DPW-ENRD, and the WDDT will work together cooperatively to help execute the bird/wildlife control program.

a. Maintain turf over the entire airfield with a dense, uniform monoculture of grass maintained between 6 and 12 inches and IAW DAAF Mowing Plan (Appendix E &F).

b. Remove or repair all old operating surfaces, broken tarmac, bare areas, etc. throughout the airfield.

c. Coordinate with DPW-ENRD for the removal of wetland habitat, where and when necessary within the airfield, and ensure any wetland impact mitigation efforts are accomplished outside the airfield boundary. Actions affecting wetlands will require permits from federal and state agencies.

d. Coordinate with DPW-ENRD for the removal all remaining trees and brush when necessary within the airfield and ensure all landscaping vegetation in proximity to the airfield is selected such that it does not attract birds and other wildlife.

e. Maintain and monitor the security/wildlife fencing to eliminate large mammal access to the airfield.

f. Conduct dispersal operations for non-nesting birds/wildlife using standard frightening techniques such as bioacoustics, pyrotechnics, gas cannons, or others.

g. Remove or configure with anti-perching devices, any known bird perches or nest sites in the airfield.

h. Conduct harassment/dispersal of birds roosting in buildings, hangars, and other airfield structures in consultation with DPW-ENRD. Coordinate with DPW-ENRD regarding birds nesting in buildings, hangars or other airfield areas.

i. Coordinate with DPW-ENRD regarding dispersal of roosting birds from local area sites through active harassment.

j. Conduct training for Airfield Management Operations, Airfield Services and other personnel and use USAF BAM and Avian Hazard Advisory System (AHAS) to provide advisories to crews entering the DAAF and surrounding airspace.

k. Prohibit all personnel from feeding or otherwise attracting birds or other wildlife near the airfield.

l. Do not allow birds or wildlife to loaf on or around the airfield especially on runways/taxiways/aprons, even when flight operations are not taking place. Bird dispersal activities should continue on weekends and holidays when aircraft activity is unlikely or slower. Birds/wildlife can quickly become accustomed to feeding on the airfield and then show up when aircraft start flying.

Appendix A
Explanation of Terms in WHMP

a. **ACTIVE BIRD DISPERSAL**. Harassment techniques employed to disperse birds or mammals from airfield and surrounding areas. Methods may include chase, pyrotechnics, and bioacoustics.

b. **BASH**. Bird/Wildlife Aircraft Strike Hazard. General term to describe wildlife hazards and wildlife hazard prevention programs.

c. **BASH ADVISORY**. A radio transmission from ATC or aircrew reporting specific bird hazard information. May be real time or disseminated in ATIS broadcasts.

d. **BIRD WATCH CONDITION (BWC)**. A bird hazard alert condition used to warn aircrew of bird activity.

e. **BWC LOW**. A BWC which indicates sparse bird activity on the airfield and a low probability of hazard.

f. **BWC MODERATE**. A BWC which indicates that moderate concentrations of birds are in a location that represent a probable hazard to flight operations.

g. **BWC SEVERE**. A BWC indicating heavy concentrations of birds on or immediately adjacent to the runway which presents an immediate hazard to flight operations; or any concentration of birds that presents a danger to aircraft.

h. **BIOACOUSTICS**. Recorded tapes of bird distress and predator call used by WDDT to disperse birds off runways and airport areas.

i. **BIRD EXCLUSION ZONE**. The designated area surrounding the airfield where bird habitation is discouraged.

j. **BIRD/WILDLIFE STRIKE**. Any contact between birds/wildlife and an aircraft, whether or not damage occurred.

k. **DEPREDATION**. Technique used to remove problem wildlife permanently from the airfield and hangars when other scare tactics are ineffective. Depredation permits are required for most species.

l. **FALCONRY**. Active dispersal of problem birds using trained falcons.

m. **FOD Council**. Foreign Object Debris (FOD) Council, meets monthly to highlight areas where items are found such as tools, trash, and materials left on taxiways, ramps etc that could be ingested into an aircraft engine.

n. **MODELS/DECOYS**. Various static devices used to disperse birds from airport areas. Many include scarecrows, decoys, Mylar tape, and eye spots.

o. **PROPANE CANNONS**. Stationary non-projectile sound producing device used to disperse birds from airport areas.

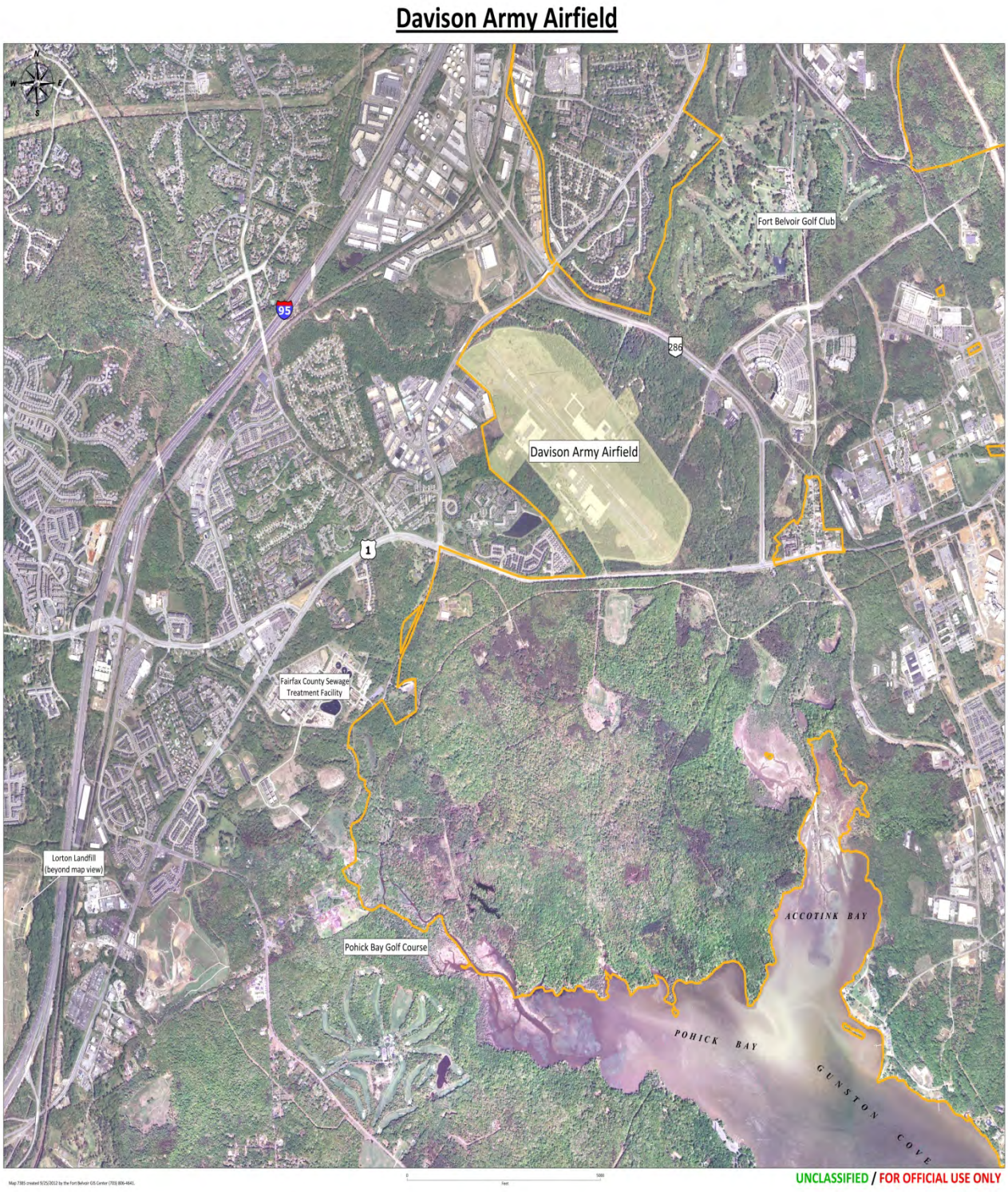
p. **PYROTECHNICS**. Noise producing devices fired from pistol or shotgun. Used by the WDDT to scare wildlife away from runways and airport areas. Pyrotechnics are Class 1.4 explosives.

q. **WILDLIFE**. Animals that include but are not limited to birds, reptiles, amphibians, and mammals.

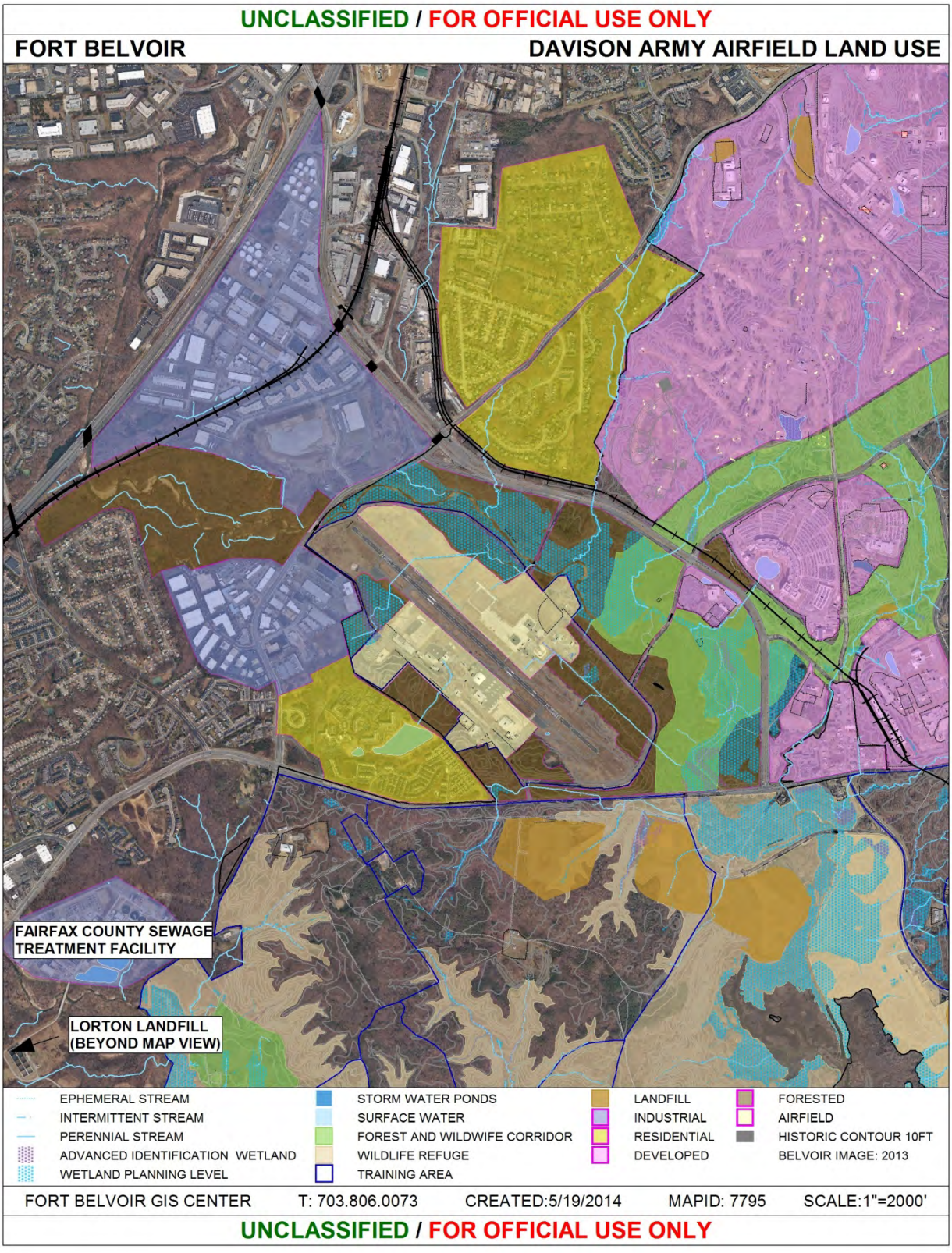
r. **WILDLIFE DETECTION AND DISPERSAL TEAM (WDDT)**. A roving airport patrol, which reports BWCs, collects/handles injured birds/wildlife and birds/wildlife carcasses/remains, and disperses problem wildlife via chase, pyrotechnic, bioacoustics, and other methods.

s. **WILDLIFE WORKING GROUP (WWG)**. Local committee concerned with the control of wildlife hazards to aviation. Executes and makes recommendations to the WHMP.

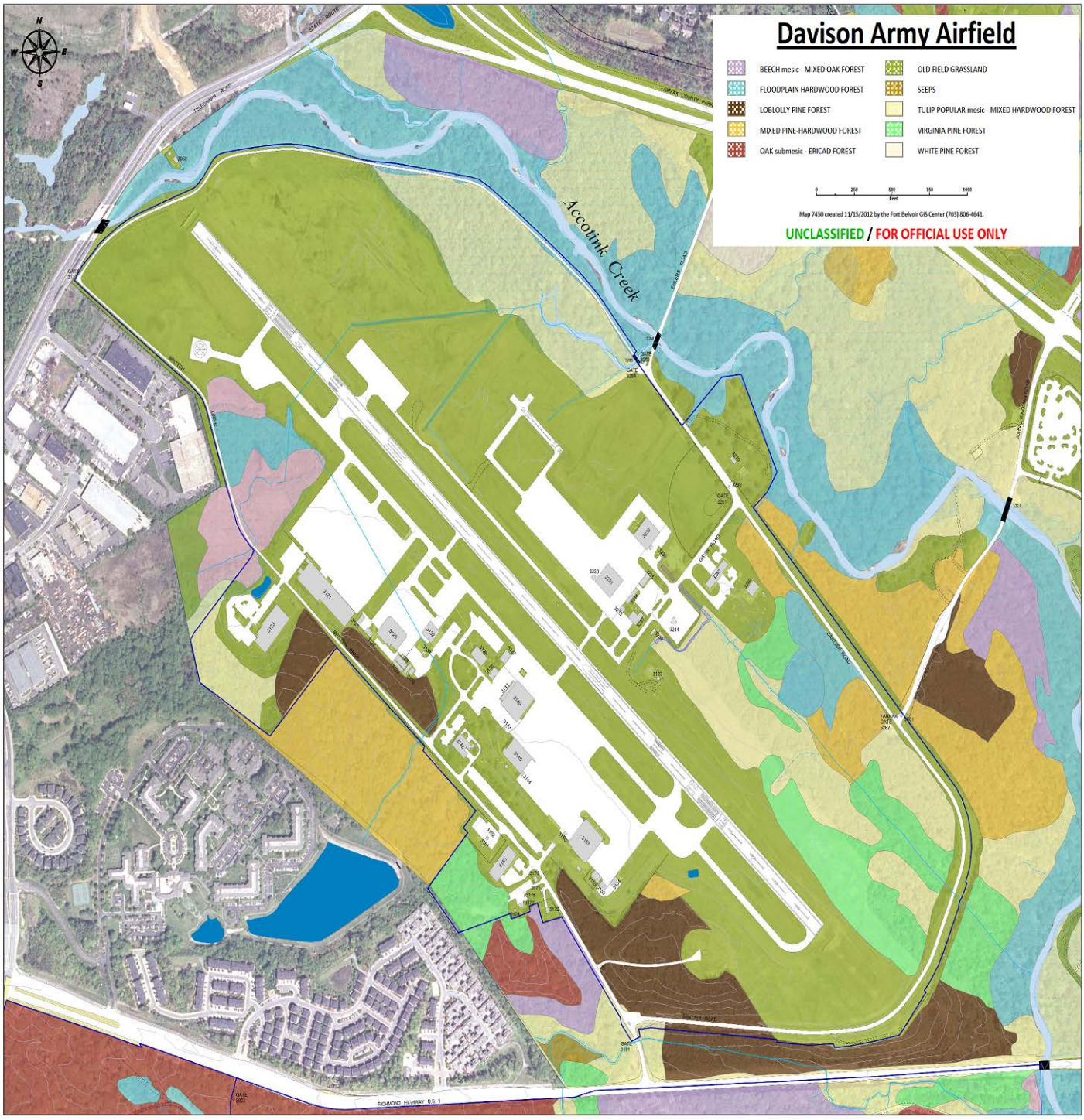
Appendix B
DAAF Overview Map



Appendix C
DAAF Land Use Map



Appendix D
DAAF Vegetation Map



Appendix E
DAAF Mowing Plan and Standard Operating Procedures

Background: Currently, Davison Army Airfield (DAAF) serves not only the transportation sector of the Army, but the environmental and natural resources sector as well. Its current location, topography, and habitat make it a suitable breeding ground for the Grasshopper Sparrow*, Ammodramus savannarum* and Eastern Meadowlark, *Sturnella magna*. DAAF has experienced between 3 and 5 pairs of Grasshopper Sparrows and 1 or 2 pairs of Eastern Meadowlarks breeding in the grassland annually.

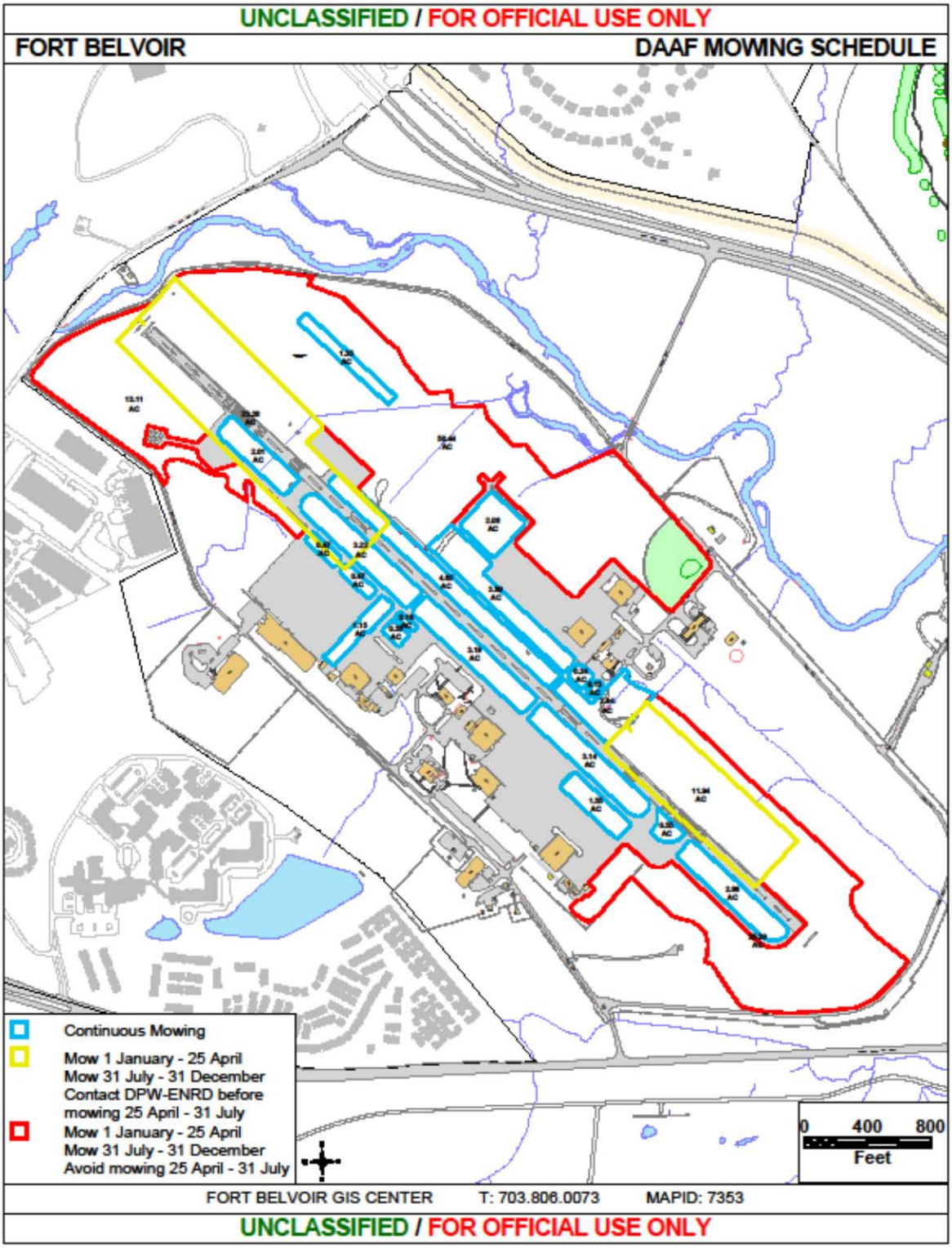
Grasshopper Sparrows and Eastern Meadowlarks seek out the grassland portions of DAAF to breed, forming a small nest on the ground. Grasshopper Sparrows spend the majority of their time down in the grass, occasionally perching on the tip of a stem of grass or manmade structure low on the ground to sing. Eastern Meadowlarks will perch atop fences and other manmade structures to sing as well. Grasshopper Sparrows are a species of regional concern and of immediate management for our region based upon assessment by Partners in Flight (PIF), an organization that has a partnership with the DoD.

Management: Current management for both species involves monitoring of the species and habitat management. Species are monitored during the months of May and June. At 4 locations of DAAF, birds are documented by both site and sound. Those heard/seen during the month of June are determined to be breeding there.

Habitat management revolves mostly around a mowing schedule of the grasslands surrounding the runway. Mowing is determined by DAAF and DPW-ENRD. Guidelines are set forth IAW AR 95-2, p.13-3.d.(7) and FAA regulations.

Procedures: The following is an outline of mowing procedures for DAAF.
(1) ILS area- grass will be maintained at 6-12 inches year round, as outlined in yellow (Appendix F).
(2) Buildings/Structures- grass will be maintained within a 10 foot boundary surrounding the structure to allow for access.
(3) Frequency- Continuous mowing Jan 1-April 25 and July 31-Dec 31- maintaining grass height between 6 and 12 inches. Shorter grass, <6 inches promotes flocking/feeding of Canada Geese. Higher grass, >12 inches deters flocking of birds. Routine mowing prohibits grass from producing seeds that attract feeding birds.
(4) Restrictions- Outside of the ILS, grass will be left undisturbed from April 25-July 31 to protect breeding birds (Grasshopper Sparrow and Eastern Meadowlark), outlined in red (Appendix F). Grass should be mowed as close to April 25 as possible and then immediately following July 31 if needed, based upon growth/rainfall as determined by DAAF.
(5) Grass will be monitored by DAAF and DPW-ENRD to determine if mowing is needed within the restricted timeframe. DPW-ENRD will coordinate with DAAF when to mow and where, in order to protect breeding birds and nests as much as possible.

Appendix F
DAAF Mowing Plan Map



Appendix G
WHMP Dispersal/Depredation Equipment

a. **GENERAL**. There are a variety of methods for dispersing birds using static, pyrotechnic, bioacoustics, and depredation equipment. Any or all of these may be used at DAAF to control birds. The WDDT must be trained in use of Bird Dispersal Equipment used at DAAF annually. Due to the Army not having a list of WHMP equipment, use Air Force Pamphlet (AFPAM) 91-212, Attachment 5, to obtain a list of WHMP equipment normally used by the Department of Defense (DoD).

b. **STATIC DETERRENT DEVICES**. Static deterrents include, but are not limited to:
(1) Propane cannons, scarecrows, silhouettes, and effigies.
(2) They are often very effective in bird deterrence. Static devices are designed to augment the activities of the bird dispersal teams.
(3) At no time should static deterrents be considered a replacement for dispersal teams.
(4) Static devices are very labor intensive and should be moved 50-100 feet from their existing locations at least once daily. This activity will inhibit the decline in their deterrent effect that can occur as wildlife begins to become accustomed to the device.

c. **PROPANE CANNONS**. These devices, which produce loud explosions at regular, pre-set intervals, can be useful in combination with other methods.
(1) The WDDT will position and operate propane cannons based on the active runway, bird locations, and air traffic density.
(2) Change the locations daily/weekly to avoid habituation by the birds.
(3) At a minimum, one cannon each should be placed at the approach end, midfield and departure end.

d. **BIOACOUSTICS**. Bioacoustics are audio-taped distress or predator call of actual birds.
(1) Special care must be taken to play the tape in short interval to prevent habituation by the birds. Play the tape 20-30 seconds, then pause briefly. Repeat as required. Birds should respond by taking flight or becoming alert.
(2) These calls are effective for waterfowl, gulls, songbirds and shorebirds.
(3) Pyrotechnics should be used in conjunction with bioacoustics to enhance complete dispersal. Bioacoustics will be the first option employed to control airfield bird habitation, however use, duration, and frequency should be altered frequently to avoid habituation.

e. **PYROTECHNICS**. Pyrotechnics are effective for dispersing most bird species and should also be used for coyotes, deer and other wildlife. Pyrotechnics may not be used without Garrison Commander and Installation approval.
(1) Pyrotechnics are to be fired from launchers that are incapable of firing live ammunition.
(2) Pyrotechnics may include a variety of devices similar to commercial fireworks, including bangers, whistlers, and screamers.
(3) Screamers and bangers are smaller diameter projectiles. These small but very loud firecrackers are shot from launchers into flocks or near individual animals to frighten them away when they are discharged.
(4) Judicious and varied use of several different kinds of pyrotechnics is important, to prevent acclimation.

f. **LETHAL CONTROL (DEPREDATION)**. Occasional depredation of birds reinforces the other methods.
(1) Rock pigeons, European starlings, and house sparrows may be removed without permit and with DPW-ENRD approval.
(2) All migratory birds, as defined by the MBTA, require a permit prior to removal.
(3) DPW-ENRD and DES personnel will advise the WDDT before any lethal control methods are conducted by DPW-ENRD, DES, or the Pest Management Contractor.
(4) DPW-ENRD or the Pest Management Contractor will collect all depredated wildlife (whether a permit was required or not) for identification, disposal, and reporting requirements.

g. **TRAINED ANIMALS**. The use of trained dogs and falcons are effective for dispersing most bird species.
(1) Border collies, in particular, are effective at dispersing Canada geese and should be used on a regular basis if deployed. As geese become accustomed to being dispersed, they will eventually vacate the area and cease returning. The use of border collies may be reduced until the Canada geese become less wary and return, at which point they may be deployed again. The use of border collies has historically been effective at DAAF.
(2) Falcons are effective at dispersing large flocks of small to medium size birds.
(3) If falconry is used, extreme caution should be exercised to ensure that only targeted species of birds are taken.
(4) Appropriate permits and contracts must be obtained for the use of trained dogs, such as border collies.

Appendix H
USAF Low-Level Bird Avoidance Model (BAM).

a. The BAM is a predictive model using Geographic Information System (GIS) technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics, combined with key environmental and man-made geospatial data. The value for each cell (or pixel) of the model is equivalent to the sum of the mean bird mass (in ounces), for all bird species present during a particular daily time period, for one of 26 two-week periods in a year. The BAM is internet accessible at the following web site: http://www.usahas.com

b. The bird species data set was derived from discrete geographic information for observations of 60 key WHMP bird species, over a 30-year period. The species data was acquired from several key datasets, including the Audubon Societies' Christmas Bird Count (CBC), the US Biologic Survey's Breeding Bird Survey (BBS), bird refuge arrival and departure data for the conterminous U.S., and many additional data specific to a particular bird species.

c. The risk levels describe three predicted risk classes - Low, Moderate, and Severe, which are based upon the bird mass in ounces per square kilometer. In other words, the risk levels represent the amount of birds (bird mass) in a kilometer squared spatial area. The "Moderate Zone" indicates a risk ratio that is 57-708 times the risk of the "Low Zone", while the "Severe Zone" indicates a risk ratio that is 2,503-38,647 times the risk of the "Low Zone".

d. The model uses the best available data for historical modeling of bird migratory patterns to provide the user with an effective decision making tool. Because birds are dynamic creatures whose migratory behavior is initiated by weather events in any given year, the model cannot be said to predict the exact movement of bird species through space and time beyond the biweekly timeframe. Spatial zones indicating a severe risk according to the model should not be ignored and should be avoided. It is not suggested that pilots fly within the "Severe Zone" unless it is absolutely mission essential.

Appendix I
FAA Form 5200-7 Bird/Other Wildlife Strike Report Form

Form Approved OMB NO. 2120-0018

U.S. Department of Transportation
Federal Aviation Administration

BIRD/OTHER WILDLIFE STRIKE REPORT

1. Name of Operator	2. Aircraft Make/Model	3. Engine Make/Model
4. Aircraft Registration	5. Date of Incident ____/____/____ Month Day Year	6. Local Time of Incident ☐ Dawn ☐ Dusk —— HR —— MIN ☐ Day ☐ Night ☐ AM ☐ PM
7. Airport Name	8. Runway Used	9. Location if En Route *(Nearest Town/Reference & State)*
10. Height *(AGL)*	11. Speed *(IAS)*	

12. Phase of Flight

- ☐ A. Parked
- ☐ B. Taxi
- ☐ C. Take-off Run
- ☐ D. Climb
- ☐ E. En Route
- ☐ F. Descent
- ☐ G. Approach
- ☐ H. Landing Roll

13. Part(s) of Aircraft Struck or Damaged

	Struck	Damaged		Struck	Damaged
A. Radome	☐	☐	H. Propeller	☐	☐
B. Windshield	☐	☐	I. Wing/Rotor	☐	☐
C. Nose	☐	☐	J. Fuselage	☐	☐
D. Engine No. 1	☐	☐	K. Landing Gear	☐	☐
E. Engine No. 2	☐	☐	L. Tail	☐	☐
F. Engine No. 3	☐	☐	M. Lights	☐	☐
G. Engine No. 4	☐	☐	N. Other:	☐	☐

(Specify, if "N. Other" is checked)

14. Effect on Flight

- ☐ None
- ☐ Aborted Take-Off
- ☐ Precautionary Landing
- ☐ Engines Shut Down
- ☐ Other: *(Specify)*

15. Sky Condition

- ☐ No Cloud
- ☐ Some Cloud
- ☐ Overcast

16. Precipitation

- ☐ Fog
- ☐ Rain
- ☐ Snow
- ☐ None

17. Bird/Other Wildlife Species

18. Number or birds seen and/or struck

Number of Birds	Seen	Struck
1	☐	☐
2-10	☐	☐
11-100	☐	☐
more than 100	☐	☐

19. Size of Bird(s)

- ☐ Small
- ☐ Medium
- ☐ Large

20. Pilot Warned of Birds ☐ Yes ☐ No

21. Remarks *(Describe damage, injuries and other pertinent information)*

DAMAGE / COST INFORMATION

22. Aircraft time out of service:	23. Estimated cost of repairs or replacement *(U.S. $)*:	24. Estimated other cost *(U.S. $) (e.g. loss of revenue, fuel, hotels)*:
_____ hours	$	$

Reported by *(Optional)*	Title	Date

Paperwork Reduction Act Statement: The information collected on this form is necessary to allow the Federal Aviation Administration to assess the magnitude and severity of the wildlife-aircraft strike problem in the U.S. The information is used in determining the best management practices for reducing the hazard to aviation safety caused by wildlife-aircraft strikes. We estimate that it will take approximately 5 minutes to complete the form. If you wish to make any comments concerning the accuracy of this burden estimate and any suggestions for reducing this burden, send those comments to the Federal Aviation Administration, Management Staff, ARP-10, 800 Independence Avenue, SW, Washington, DC 20591. The information collected is voluntary. Please note that an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control number associated with this collection is 2120-0045.

FAA Form 5200-7 (3-97) Supersedes Previous Edition ☆ U.S. GPO: 1997-418-084/64203 NSN:0052-00-651-9005

Appendix J
Passive WHMP control methods

a. **MANAGING GRASS HEIGHT**. See Appendix E.

b. **CONTROLLING BROAD-LEAFED WEEDS**. Keep broad-leafed weeds to a minimum on the airfield. Herbicide application must be conducted by the DPW Pest Management Program. Broad-leafed weeds attract a variety of birds, may produce seeds or berries, and may limit grass growth.

c. **PLANTING BARE OR ERODABLE AREAS**.
(1) Eliminate bare areas on the airfield. Plant grass as necessary and appropriate, to maintain ground cover at 6"-12" in height.
(2) The following grass mixture/blend is designed for areas that receive little or no supplemental fertilization or irrigation. Often used for grass bunkers or fairway roughs in today's golf courses. In the un-mowed state, creates a "Scottish links" golf rough appearance.
35% Defiant Hard Fescue
35% Shademark Red Fescue
20% Brittany Chewings Fescue
10% Quatro Sheep Fescue
This mixture, or one close to this, is recommended for any re-seeding or new planting.

d. **REMOVING HABITAT DIVERSITY/EDGE EFFECT**. The greatest numbers of species but not necessarily the greatest numbers of each species are found where vegetation types change from forests to brush, or brush to grass (edge effects).
(1) To reduce wildlife attractiveness, keep edge effects to a minimum, or as far from the active runway as possible. If an airfield has clumps of brush and shrubs around the grass, more diverse habitat is available.
(2) Remove brush and weeds to maintain the airfield in the most uniform condition possible. This eliminates the cover many birds and rodents require.
(3) Single trees or snags on an airfield may provide perches for hawks, owls, or other bird species.
(4) Biodiversity practices should not be implemented on airfields.

e. **LEVELING OF AIRFIELD/HELIPORT**. Level or fill high or low spots to reduce attractiveness to birds and prevent standing water.
If wetlands are to be altered, permits are required and work is coordinated by DPW-ENRD.

f. **REMOVAL OF INJURED BIRDS/WILDLIFE OR BIRDS/WILDLIFE CARCASSES/REMAINS FROM THE AIRFIELD/HELIPORT**. This is to avoid attracting scavengers that may feed on them.
Forward all remains from aircraft strikes, depredation activities, or found dead to DPW-ENRD or Installation Pest Manager for identification and/or disposal as needed.

g. **REMOVING DEAD VEGETATION**. As soon as possible, remove dead vegetation such as brush piles, grass clippings, etc.., and the cover it affords.

h. **MAINTAINING DRAINAGE DITCHES**. Fresh water is one of the most important airfield wildlife attractants.
(1) Standing water creates a source of drinking water and a breeding place for insects, amphibians, and other food sources for birds.
(2) Regularly inspect ditches to keep them clear.
(3) Maintain ditched streams using the 2-stage ditch design to improve drainage and water quality, and to discourage wading birds and emergent vegetation.
(4) Ditches that meet wetland criteria or are constructed on upland areas can be maintained in a trapezoidal or V-shaped design.
(5) Improve drainage as necessary to inhibit even temporary ponds or puddles, permits are required for this activity.
(6) Working in and around wetlands (e.g. ditches and creeks) must be done in coordination with DPW-ENRD and may require permits.

i. **ELIMINATE ROOSTING SITES**. Control roosts by vegetation management of roost sites where possible. Prune or cut down trees to reduce the number of perches if necessary.

j. **BIRD PROOF BUILDINGS AND HANGARS**. Often, bird proofing of buildings and hangars is required to exclude pigeons, sparrows, and swallows.
(1) Excluding birds from a structure they currently utilize will often displace them to an adjacent structure.
(2) Keeping all structures bird proof eliminates most problems.
(3) Lethal control of birds in buildings must be done in accordance with state and federal permits and can only be conducted by DPW-ENRD and the Pest Management Contractor.
(4) Denying access by screening windows, closing doors as well as hangar doors, and blocking entry holes is most effective.
(5) When necessary, consider:
(a) Netting. Though expensive, provides an excellent long-term defense against birds returning to hangars. Install under superstructure to exclude birds from roosting areas while allowing the doors to be open during hangar operations.
(b) Trapping and Removal. Use a large cage with food and water to trap birds. Release birds away from buildings or depredate if permitted by law. Permits are required for handling of all birds and wildlife. All trapping must be conducted by DPW-ENRD or DPW's Pest Management Contractor.
(c) Design Features. If designing a new hangar, consider locating supports on the exterior.
(5) Sharp Projections. Use in limited areas such as ledges and overhangs, or small places where birds cannot be allowed.
(6) Maintain perimeter fence and gates around the boundaries of DAAF to exclude large mammals (e.g., deer).

Appendix K
Bird/Wildlife Management Techniques and Recommendations

TECHNIQUES AND RECOMMENDATIONS
Bird control and dispersal should primarily be accomplished by the WDDT. These measures should be readily available at any time when birds or other wildlife threaten airfield/heliport operations.

a. **ACTIVE HARASSMENT**.
(1) Each airfield should have enough harassment tools to effectively control and harass bird/wildlife on the airfield. Many airfield personnel only use their vehicle horn/siren to harass birds. This is not considered an effective WHMP program. While a vehicle horn/siren may work temporarily to get the birds to fly or move, it normally does not scare the birds enough to deter their return to the same location when the vehicle is gone. Active harassment requires adequate tools (pyrotechnics/bioacoustics/propane cannons, trained dogs/falcons) to effectively deter birds from the airfield.
(2) In most situations, the combination of human/trained animal presence and pyrotechnics will be enough to prevent birds from landing and feeding. These two methods should form the foundation of the bird harassment program. However, judicious and varied use of several different types of harassment tools is preferred, to prevent acclimation. A combination of frightening devices should be available for use whenever birds are present on the airfield/heliport or in surrounding areas. Primary among those are dogs/falcons that are trained to harass and disperse. Other options are pyrotechnic devices that can be fired from 15mm “starter” pistols or modified flare pistols. Pyrotechnics are listed in the Air Force Table of Allowances, no such Army equivalent exists for airfield use, though explosive procurement and storage requirements for other such materials can be followed. Airfield bird control devices may also be ordered through local purchase mechanisms, however prior coordination with munitions experts and safety personnel must be accomplished. Such devices project pyrotechnics many meters over flocks of birds that present hazards. Skillful use of the devices can disperse birds from the field in desired directions. They produce a variety of loud sounds and explosions, bright flashes of light, and/or trailing smoke. Training for safely using the devices and coordination with airborne aircraft through direct communications is imperative to avoid scaring birds into active flight paths. Pyrotechnic devices can be extremely effective in dispersing waterfowl, gulls, crows, shorebirds, starlings, and flocks of blackbirds. Gulls, starlings, crows, and blackbirds may also be dispersed using a combination of pyrotechnics and bioacoustics.
(3) Bioacoustics is the recorded distress and alarm calls of species to be dispersed. Ensure species-specific calls are used. They are projected over a speaker system that may be mounted on the roof or through the window of a vehicle. Birds will sometimes disperse upon hearing species-specific calls, but may come to investigate the source of the sound and can then be encouraged to leave using pyrotechnic devices. These active harassment techniques should be used on the airfield and in all hazardous surrounding areas. These techniques may also be used in coordination with local property owners, to disperse any known bird roosts from dense trees such as found in nearby parks, golf courses, ponds, and other structures.

(4) Additional harassment techniques such as networks of remotely triggered gas cannons, radio-controlled model aircraft, trained border collies, or others can be considered as effective supplements to other dispersal techniques. Creativity and intensity of such programs will make the overall effort much more successful and delay habituation to the combination of techniques.

b. **WATERFOWL CONTROL ON PONDS AND SURRONDING PROPERTIES**.
There are a variety of waterfowl species that pose very significant potential hazards to aircraft operating from the DAAF and surrounding areas. Canada Geese, and particularly resident populations, may be most significant. In fact, these may be the most significant hazard to aviation noted at the DAAF. These birds are attracted to open-water ponds and associated managed grassy areas. Birds trade between each of these features, open grassy fields, parks, golf courses, and others and necessarily transit the airfield to do so. Some of these hazards are not possible to control as birds may merely be migrating through the region during spring and fall, or exhibiting local movement patterns between features in the vicinity of the installation. However, local non-migratory resident Canada Geese pose the most significant problems and will attract many of these migratory birds to areas where they feel secure in areas occupied by resident birds. It is imperative to control resident goose populations if hazards are to be avoided. It must also be emphasized that there are potentially significant health risks associated with large goose populations in heavily used areas in addition to the aviation hazard. There are several mitigating measures that may be employed.

c. **DEPREDATION AND CONTROLLED HUNTING**.
In addition to the geese detailed above, removal of nuisance birds and other wildlife may be conducted with appropriate Federal and State permits by federal, state, or contracted personnel. Trapping and/or shooting of individuals or flocks of birds such as starlings, pigeons, and house sparrows, or other wildlife such as foxes, deer, or rodents may be required on a periodic basis. Depredation is a last resort measure that may reinforce other habitat management or active control efforts and is recommended when a severe hazard persists for several days. Such an effort must be carefully controlled and conducted in full compliance with conditions of state and federal permits. Leaving dead birds or effigies exposed for a day or two following such efforts may also reinforce these techniques. Dead birds must not be placed near the operating surfaces as they may attract scavengers and increase the hazard.
Use of depredation permits as a supplement to the installation's annual hunting programs is an excellent means of attempting to keep deer and other wildlife populations below carrying capacity such that they are less prone to disperse to areas including the airfield. These programs should continue in the future. One area to monitor however is to ensure gut piles or animal remains do not attract vultures, hawks, eagles, and other scavengers that may cause hazards to aircraft operations. Removal of entire carcasses or burial of remains may be necessary as conditions for hunting access to the installation if it is determined that exposed remains are attracting hazardous birds or other wildlife. Carcasses and offal left in the field could significantly adversely affect hazardous bird concentrations. Scavengers such as Turkey Vultures, Bald Eagles, and other raptors, as well as other species will exist in higher than normal numbers if provided supplemental food sources. In addition to causing hazardous concentrations, such practices can lead to long-term increases in local scavenging bird populations and further exacerbate the

potential hazards. Not only is there an immediate food source available, but freezing temperatures and snow cover during and following hunting seasons can allow these food sources to persist well into the following spring. Although the terrain may make removal of whole carcasses or offal difficult, every effort must be made to remove these animals from the field following hunts and depredation efforts should it be determined that scavenging birds present a WHMP concern. As the post requires hunters to check in and sign waiver forms to hunt on the property and also check out with any animals harvested, monitoring of compliance should be relatively easy to enforce should it be determined necessary.

Appendix L
Local Wildlife Species

GENERAL. The following is a summary of wildlife within the airfield environment. Associated with each is a brief description of how they can be controlled or avoided. Each control measure will require action by one or more tasked organizations as described in Section 2. It is very important to know which wildlife species or airfield attractants are present before control techniques can be effectively applied. As such, all WDDT personnel must be trained in wildlife identification.

a. **BIRDS**

(1) Gulls. These birds represent the most significant hazard to aircraft at airports worldwide. Due to their omnivorous feeding habits and preference for flat, open areas to rest, they are commonly found on airfields/heliports. Gulls are most active just after sunrise and before sunset as they move to and from feeding areas. Maintenance of grass height higher than 7 inches is critical in reduction of gull numbers. Even with this in effect, gulls may inhabit the airfield, particularly, during inclement weather. Persistent harassment using pyrotechnics and bioacoustics is necessary to discourage these birds. Other techniques such as gas cannons, model gulls, radio-controlled model aircraft, trained dogs, and even falconry should be considered if available and cost-effective.

(2) Wild Turkey. Wild turkeys are most effectively controlled through habitat management including proper grass-height, elimination of roosting and food sources, and reduction of habitat diversity. Do not allow grass to exceed 18 inches and eliminate all weeds and brush patches on the fields, particularly if the plants are seed producing. Pyrotechnics, gas cannons, live ammunition or periodic hunts can effectively disperse these birds.

(3) Raptors (Hawks, Falcons, Eagles, Vultures). These birds can be particularly hazardous to aircraft because of their size and widespread distribution over bases and low-level areas. Raptors (particularly vultures) use thermals to their advantage to search for prey. These birds become active during mid-morning and remain aloft until late afternoon. In the fall, raptors migrate by day to areas of heavy winter concentrations in the southern states. Removal of dead animals and removal of dead trees and other perching sites on the airfield can control these birds. Avoid mowing during bird nesting season to reduce the number of dead birds, see DAAF Mowing Plan. Pyrotechnics may be used to frighten raptors from the airfield.

(4) Waterfowl (ducks, geese, swans). Resident waterfowl nesting in the area during the summer tend to be attracted to ponds, lakes, and the like. A resident goose depredation permit can only be obtained by DPW-ENRD via the United States Fish and Wildlife Service (USFWS) for the months of March thru June on a yearly basis. The permit must be renewed yearly. Migrating waterfowl during spring and fall can potentially be dangerous to flight safety due to the large numbers of birds traveling between their breeding and wintering grounds. Migrating birds are most active from sunset through midnight, with numbers decreasing in the early morning hours. Avoidance of flying during the evening hours is generally safest. If migrating waterfowl land at DAAF, pyrotechnics, gas cannons, trained dogs, and effigies are all excellent control techniques. The greatest hazard from waterfowl exists upon the approach to DAAF because of the existence of the Potomac River flyway to the east and south of DAAF. Monitoring and communication of conditions is paramount for taking action for appropriate flight response.

(5) Owls. Most owls are nocturnal and attracted to rodents as a food source. Limit the number of perch sites by removing perch sites such as unnecessary fence posts and dead trees.
(6) Swallows and Swifts. These birds eat insects in flight and are commonly found above airfields/heliports. Discouragement of nesting is the most effective way to reduce swallows and swifts. Remove mud nest from hangars, etc. with a hose as the birds begin nesting and when nesting is complete. Nest(s) must be removed before egg(s) are present. Once egg(s) are present, nest(s) may not be removed until egg(s) have hatched and fledgling(s) have vacated the nest(s) IAW the Migratory Bird Treaty Act (MBTA). This is true for all birds covered under the MBTA. Nesting in hangars can be discouraged by harassing the birds as they work on building the nests as well as installation of nesting/perching exclusion structures. If Swallows are noted resting on runways or taxiways, use pyrotechnics to disperse them. Nest removal (an action requiring permits) from hangars shall be coordinated with the DPW-ENRD and DES.
(7) Crows, Ravens, Blackbirds, Grackles, Cowbirds, and Starlings. These birds can be particularly hazardous because they frequently occur in large flocks particularly at sunset as they return to roost sites. These birds are generally attracted to flat, open areas to feed, rest, or stage/pre-roost; they are also attracted to dumpsters and garbage bins. Maintenance of grass height between 6 and 12 inches is the best control method. Remove any known roost sites or thin individual roost trees. Bioacoustics, pyrotechnics, and depredation can be used to frighten and remove these birds. Starlings are not federally protected and may be removed without permits with DPW-ENRD approval. Permits are required for other species. If these birds occur in hangars, removal or modification of the perches are recommended to eliminate the problem. Avoid flying near known roosts, especially at sunrise and sunset and during spring and fall migration.
(8) House Sparrows. These birds are not commonly struck by aircraft, but are common pests around structures. House Sparrows often nest in hangars and dense shrubs and trees. These birds are not protected by law and may be destroyed without a permit with DPW-ENRD approval. If these birds occur in hangars, removal or modification of the perches or nesting areas is recommended to eliminate the problem. Frightening techniques are usually ineffective against these birds.
(9) Rock Pigeons and Doves. These birds are seedeaters and are attracted to seed-producing weeds, grasses, and shrubs. Open areas or bare spots are attractive as resting or feeding sites. Pyrotechnics can be effective in frightening these birds. Proper turf management can limit the number of pigeons and doves on the field. A falconry program may effectively control pigeons and doves on the airfield. Rock Pigeons frequently occur in structures such as hangars and are not protected by law and may be destroyed without a permit with DPW-ENRD approval. Netting, shooting, trapping, and use of falcons or hawks can drastically reduce their numbers in these structures.

b. **MAMMALS**.
While concern is mostly centered on birds, several mammalian species also pose threats to flight operations and must be considered. As for all wildlife, close coordination with the installation's Fish and Wildlife Management Program is necessary to reduce hazards.
(1) Deer. Deer pose the greatest threat to aircraft due to their size and preferred nocturnal activities. Control techniques include modifying and maintaining existing perimeter fences and gates to make them less likely to allow access by deer. This includes continual monitoring of gates any time they must be open for access for any reason. Selective

shooting of deer posing a safety threat inside the airfield boundaries shall be used as a last resort by the DES Game Warden and in coordination with DPW-ENRD. State permits are required.
(2) Coyotes and foxes. These animals are attracted to airfields/heliports by rodents, rabbits and other food sources. Dens may be found in banks, culverts, or other suitable areas. Rodent control through habitat modification will reduce the likelihood these animals will enter DAAF; pyrotechnics can also be used to frighten these animals. Shooting and trapping of individual animals in specific circumstances can be evaluated on a case-by-case basis. State permits are required. Under no circumstances should coyotes/foxes be allowed on the airfield as a way to keep other rodents/rabbits off the airfield.
(3) Rabbits and rodents. These animals often attract raptors, coyotes, and foxes. Proper grass management will reduce the numbers of these animals on airfields/heliport.

*Adapted from the June 2011 IMCOM Bird/Wildlife Aircraft Strike Hazard (BASH) Plan and modified to reflect DAAF specific conditions.

Appendix H

Approved Plant List for Fort Belvoir

Approved Plant List for Fort Belvoir

24 Nov 14

1) Large street trees: 2.5-3" Dutch Elm Disease resistant American elm cultivar (*Ulmus americana* 'Valley Forge', 'New Harmony', 'Jefferson', or 'Princeton', best if mixed), willow oak (*Quercus phellos*), Shumard oak (*Quercus shumardii*), swamp white oak (*Quercus bicolor*), fruitless male Kentucky coffeetree (*Gymnocladus dioica* 'Espresso' or 'Stately Manor').

2) Large lawn trees (12' or farther away from sidewalk and/or paved areas): 2.5-3" scarlet oak (*Quercus coccinea*), pin oak (*Quercus palustris*), sugar maple (*Acer saccharum*), 7-8' Southern magnolia (*Magnolia grandiflora*), bald cypress (*Taxodium distichum*).

3) Evergreen screening: 7-8' Nellie R. Stevens holly (*Ilex* x 'Nellie R. Stevens'), Eastern redcedar cultivars (*Juniperus virginiana* 'Canaertii,' 'Elegantissima', 'Keteleeri', 'Manhattan Blue'), Foster holly (*Ilex* x *attenuata* 'Fosteri'), American holly cultivars (*Ilex opaca* 'Jersey Princess', 'Old Heavy Berry').

4) Small and medium street trees: 6-7' 'Winter King' southern hawthorn (*Crataegus viridis* 'Winter King'), 2.5-3" Seedless sweet gum (*Liquidambar styraciflua* 'Rotundiloba').

5) Trees for narrow planting situations: 2.5-3" upright English oak (*Quercus robur* Rosehill 'Asjes'), upright European hornbeam (*Carpinus betulus* 'Fastigiata').

6) Flowering ornamental trees: 7-8' Downy serviceberry (*Amelanchier arborea*), Appalachian Spring dogwood (*Cornus florida* 'Appalachian Spring'), native flowering and Kousa dogwood hybrids (*Cornus* X 'Rutcan', Cornus X 'Stellar® Series'), Carolina Silverbell (*Halesia carolina*), sweetbay magnolia cultivars (*Magnolia virginiana* 'Henry Hicks' or 'Moonglow'), crape myrtle cultivars (*Lagerstroemia* 'Apalachee', 'Lipan', 'Natchez', 'Tuskegee').

7) Shrubs (sun): Virginia sweetspire (*Itea virginica* 'Little Henry' or 'Henry's Garnet'), large fothergilla (*Fothergilla major*), chokeberry (*Aronia* spp.), winterberry (*Ilex verticillata*), dwarf fothergilla (*Fothergilla gardenii*), sweet pepperbush (*Clethra alnifolia*), northern bayberry (*Myrica pensylvanica*), box sandmyrtle (*Leiophyllum buxifolium*), New Jersey tea (*Ceanothus americanus*), arrowwood viburnum (*Viburnum dentatum* 'Blue Muffin' or 'Ralph Senior'), inkberry (*Ilex glabra* 'Shamrock' or 'Densa'), blackhaw viburnum (*Viburnum prunifolium* species or 'Summer Magic').

8) Shrubs (shade): oakleaf hydrangea (*Hydrangea quercifolia*), Annabelle hydrangea (*Hydrangea aborescens* 'Annabelle'), garden glow dogwood (*Cornus hessei* 'Garden Glow'), gold dust dwarf aucuba (*Aucuba japonica* 'Variegata nana'), Goshiki osmanthus (*Osmanthus heterophyllus* 'Goshiki'), Midwinter Fire bloodtwig dogwood (*Cornus sanguinea* 'Midwinter Fire'), Ivory Halo tartarian dogwood (*Cornus alba* 'Ivory Halo' or 'Bailhalo'), yellow twig dogwood (*Cornus sericea* 'Flaviramea'), pinxterbloom azalea (*Rhododendron*

periclymenoides), P.J.M. rhododendron (*Rhododendron x* ‘P.J.M.’), pipestem (*Agarista populifolia*).

9) Perennials (sun): purple coneflower (*Echinacea purpurea* ‘Magnus’ or ‘White Swan’), perennial Black-eyed Susan (*Rudbeckia fulgida* ‘Goldsturm’), butterfly weed (*Asclepias tuberosa*), yarrow (*Achillea millefolium*), red columbine (*Aquilegia canadensis*), New England aster (*Symphyotrichum novae-angliae*), Joe Pye weed (*Eupatorium maculatum*), blue star (*Amsonia tabernaemontana* ‘Blue Ice’).

10) Perennials and ferns (shade): hosta (*Hosta* spp.), bee balm (*Monarda didyma* ‘Gardenview Scarlet’ or ‘Jacob Cline’), Alleghany pachysandra (*Pachysandra procumbens*), creeping phlox (*Phlox stolonifera* ‘Sherwood Purple’), Christmas fern (*Polystichum acrostichoides*), cinnamon fern (*Osmunda cinnamomea*), New York fern (*Thelypteris noveboracensis*), ostrich fern (*Matteuccia struthiopteris*).

Appendix I

Animal Species on Fort Belvoir Main Post

Common Name	Scientific Name	Abundance			Stream Size	Spawn Status
		Spring	Summer	Fall		
Lampreys						
American brook lamprey	*Lethenteron appendix*	o	r	o	1	R
Least brook lamprey	*Lampetra aepyptera*	o	o	o	1	R
Sturgeons						
Atlantic sturgeon	*Acipenser oxyrinchus*	r	r		2	A
Gars						
Longnose gar	*Lepisosteus osseus*	c	r	o	2	R
Bowfins						
Bowfin	*Amia calva*	r	r	r	2	R
Freshwater eels						
American eel	*Anguilla rostrata*	a	a	c	3	C
Anchovys						
Bay anchovy	*Anchoa mitchilli*	o	r	o	2	E
Herrings						
Alewife	*Alosa pseudoharengus*	a	a	a	2	A
American shad	*Alosa sapidissima*				2	A
Blueback herring	*Alosa aestivalis*	c	a	a	2	A
Gizzard shad	*Dorosoma cepedianum*	a	a	a	2	R
Carps and Minnows						
Blacknose dace	*Rhinichthys atratulus*	a	a	a	3	R
Common carp	*Cyprinus carpio*	a	a	a	2	R
Common shiner	*Luxilus cornutus*	a	a	a	3	R
Creek chub	*Semotilus atromaculatus*	c	c	c	1	R
Cutlip minnow	*Exoglossum maxillingua*	r	r	r	2	R
Eastern silvery minnow	*Hybognathus regius*	o	a	a	3	R
Fallfish	*Semotilus corporalis*	r	r	r	3	R
Golden shiner	*Notemigonus crysoleucas*	o	a	o	3	R
Goldfish	*Carassius auratus*	o	o	o	2	R
Longnose dace	*Rhinichthys cataractae*	c	a	a	3	R
River chub	*Nocomis micropogon*	o	a	c	3	R
Rosyside dace	*Clinostomus funduloides*	a	a	a	1	R
Satinfin shiner	*Cyprinella analostana*	r	r	r	3	R
Spotfin shiner	*Cyprinella spiloptera*	c	a	a	3	R
Spottail shiner	*Notropis hudsonius*	a	a	a	3	R
Swallowtail shiner	*Notropis procne*	r	o	o	3	R
Suckers						
Eastern creek chubsucker	*Erimyzon oblongus*	c	c	c	3	R
Northern hog sucker	*Hypentelium nigricans*	r	r	o	2	R
Quillback	*Carpoides cyprinus*	r	c	r	2	R
Shorthead redhorse	*Moxostoma macrolepidotum*	r	r	r	2	R
White sucker	*Catostomus commersonii*	c	c	c	3	R
North American catfishes						
Brown bullhead	*Ameiurus nebulosus*	c	c	c	2	R
Blue catfish	*Ictalurus furcatus*	o	o	o	2	R
Channel catfish	*Ictalurus punctatus*	c	c	c	2	R
Flathead catfish	*Pylodictis olivaris*	r	r	r	2	R
Yellow bullhead	*Ameiurus natalis*	c	c	c	2	R
White catfish	*Ameiurus catus*	o	o	o	2	R
Trouts						
Rainbow trout	*Oncorynchus mykiss*	r	r	r	3	R
Mudminnows						
Eastern mudminnow	*Umbra pygmaea*	c	c	c	1	R
Silversides						
Inland silverside	*Menidia beryllina*	c	a	a	2	R
Needlefishes						
Atlantic needlefish	*Strongylura marina*	r	o	r	2	E

Topminnows						
Banded killifish	*Fundulus diaphanus*	a	a	a	3	R
Mummichog	*Fundulus heteroclitus*	c	o	c	2	R
Livebearers						
Eastern mosquitofish	*Gambusia holbrooki*	o	o	o	3	R
Western Mosquitofish	*Gambusia affinis*	o	o	a	2	R
Temperate basses						
Striped bass (rockfish)	*Morone saxatilis*	a	a	a	2	R
White perch	*Morone americana*	a	a	a	2	A
Sunfishes						
Black crappie	*Pomoxis nigromaculatus*	o	o	o	2	R
Bluegill	*Lepomis macrochirus*	a	a	a	3	R
Bluespotted sunfish	*Enneacanthus gloriosus*	o	r	o	3	R
Green sunfish	*Lepomis cyanellus*	o	o	o	3	R
Largemouth bass	*Micropterus salmoides*	c	c	c	2	R
Longear sunfish	*Lepomis megalotis*	r	o	r	3	R
Pumpkinseed	*Lepomis gibbosus*	a	a	a	3	R
Redbreast sunfish	*Lepomis auritus*	a	a	a	3	R
Redear sunfish	*Lepomis microlophus*	r	r	r	3	R
Smallmouth bass	*Micropterus dolomieu*	r	r	r	2	R
Warmouth	*Lepomis gulosus*	o	o	o	2	R
White crappie	*Pomoxis annularis*	r	r	r	2	R
Perches and darters						
Tessellated darter	*Etheostoma olmstedi*	a	a	a	3	R
Yellow perch	*Perca flavescens*	c	c	c	2	R
Drums						
Spot	*Leiostomus xanthurus*	r	r	r	2	R
Snakeheads						
Northern snakehead	*Channa argus*	c	c	c	2	R
Soles						
Hogchoker	*Trinectes maculatus*	c	r	r	2	R

*Species are listed in accordance with the American Fisheries Society (AFS) checklist, 7th edition, 2013

Abundance Codes:
a- abundant, numerous individuals, captured in high numbers at several stations
c- common, likely to be captured, present, but not at every station
o- occasional, possible to be captured, only captured every now and then
r- rare, unlikely to be collected, captured at few stations in very low numbers

Seasons:
Spring = March-May
Summer = June-July
Fall = August-October

Steam Status:
1 = Small Stream (i.e. Mason Run)
2 = Large Stream (i.e. Accotink Creek)
3 = Uses both small and large streams

Spawning Status:
A = Anadromous, fishes living in the ocean, but which enter freshwater streams to spawn
C = Catadromous, fishes living in freshwater streams, but which return to the ocean to spawn
E = Estuarine, fishes unlikely to be located above the mouth of a stream
R = Resident, fishes that are year round residents

Common Name	Scientific Name	Regional Abundance
Small sized mammals		
Brown rat (Norway rat)	*Rattus norvegicus*	U
Deer Mouse	*Peromyscus maniculatus*	U
Eastern Mole	*Scalopus aquaticus*	C
House Mouse	*Mus musculus*	C
Least Shrew	*Cryptotis parva*	U
Marsh rice Rat	*Oryzomys palustris*	C
Meadow jumping Mouse	*Zapus hudsonius*	U
Meadow Vole	*Microtus pennsylvanicus*	C
Northern short-tailed shrew	*Blarina brevicauda*	C
Pygmy shrew	*Sorex hoyi*	U
Smoky shrew	*Sorex fumeus*	U
Southeastern shrew	*Sorex longirostris*	U
Star-nosed mole	*Condylura cristata*	U
White-footed mouse	*Peromyscus leucopus*	C
Woodland vole	*Microtus pinetorum*	C
Bats		
Big brown bat	*Eptesicus fuscus*	C
Evening bat	*Nycticeius humeralis*	C
Hoary bat	*Lasiurus cinerus*	U
Indiana bat	*Myotis sodalis*	U
Little brown bat	*Myotis lucifugus*	U
Northern long-eared bat	*Myotis septentrionalis*	U
Red bat	*Lesiurus borealis*	C
Silver-haired bat	*Lasionycterius noctivagans*	U
Small-footed bat	*Myotis leibii*	U
Tri-colored bat	*Perimyotis subflavus*	C
Medium sized mammals		
American mink	*Mustela vison*	U
Beaver	*Castor canadensis*	C
Eastern chipmunk	*Tamias striatus*	C
Eastern cottontail	*Sylvilagus floridanus*	C
Eastern gray squirrel	*Sciurus carolinensis*	C
Long-tailed weasel	*Mustela frenata*	U
Muskrat	*Ondatra zibethicus*	C
Raccoon	*Procyon lotor*	C
River otter	*Lantra canadensis*	U
Southern flying squirrel	*Glaucomys volans*	C
Striped skunk	*Mephitis mephitis*	C
Virginia opossum	*Didelphis virginiana*	C
Woodchuck (groundhog)	*Marmota monax*	C
Large sized mammals		
Bobcat	*Lynx rufus*	U
Eastern coyote	*Canis latrans*	C
Gray fox	*Urocyon cinereoargenteus*	U
Red fox	*Vulpes vulpes*	C
White-tailed deer	*Odocoileus virginiana*	C

Abundance Codes:

C- Common

U- Uncommon

Common Name	Scientific Name	Abundance				Breeding
		Winter D, J, F	Spring M, A, M	Summer J, J, A	Fall S, O, N	
Geese, Ducks, and Swans						
Snow goose	*Chen caerulescens*	r				N
Canada goose	*Branta canadensis*	a	a	a	a	Y
Tundra swan	*Cygnus columbianus*	c	u		r	N
Wood duck	*Aix sponsa*	r	c	c	c	Y
Gadwall	*Anas strepera*	c	u		c	N
American wigeon	*Anas americana*	u	u		r	N
American black duck	*Anas rubripes*	c	c	r	u	Y
Mallard	*Anas platyrhynchos*	a	a	c	a	Y
Blue-winged teal	*Anas discors*	r	u	r	u	N
Northern shoveler	*Anas clypeata*	r	o		o	N
Northern pintail	*Anas acuta*	u	o		u	N
Green-winged teal	*Anas crecca*	o	u	r	u	N
Canvasback	*Aythya valisineria*	u	o		r	N
Redhead	*Aythya americana*	u	o		r	N
Ring-necked duck	*Aythya collaris*	c	o		o	N
Greater scaup	*Aythya marila*	o	r		r	N
Lesser scaup	*Aythya affinis*	c	c		u	N
Surf scoter	*Melonitta perspicillata*	r				N
White-winged scoter	*Melonitta deglandi*	r				N
Long-tailed duck (Oldsquaw)	*Clangula hyemalis*	r				N
Bufflehead	*Bucephala albeola*	c	o		u	N
Common goldeneye	*Bucephala clangula*	r				N
Hooded merganser	*Laphodytes cucullatus*	c	o	r	u	Y
Common merganser	*Mergus merganser*	c	u		r	N
Red-breasted merganser	*Mergus serrator*	o	u		o	N
Ruddy duck	*Oxyura jamaicensis*	c	u		o	N
Quail						
Northern bobwhite	*Colinus virginianus*	r	r	r	r	Y
Turkeys						
Wild turkey	*Meleagris gallopavo*	u	u	u	u	Y
Grebes						
Pied-billed grebe	*Podilymbus podiceps*	c	u	r	o	N
Horned grebe	*Podiceps auritus*	r	r		r	N
Red-necked grebe	*Podiceps gisegena*	r	r		r	N
Pigeons and Doves						
Rock pigeon	*Columba livia*	u	u	u	u	Y
Mourning dove	*Zenaida macroura*	a	a	a	a	Y
Cuckoos						
Yellow-billed cuckoo	*Coccyzus americanus*		u	c	u	Y
Black-billed cuckoo	*Coccyzus erythropthalmus*		r	r	r	N
Nightjars						
Common nighthawk	*Chordeiles minor*		u	r	u	N
Chuck-will's-widow	*Antrostomus carolinesis*		r	r		N
Whip-poor-will	*Antrostomus vociferous*		r	r	r	Y
Swifts						
Chimney swift	*Chaetura pelagica*		c	a	c	Y
Hummingbirds						
Ruby-throated hummingbird	*Archilochus colubris*		c	c	u	Y
Rails and Coots						
King rail	*Rallus elegans*		r	r	r	Y
Virginia rail	*Rallus limicola*		r	r	r	Y
Sora	*Porzan carolina*		r		r	N
Common moorhen	*Gallinula chloropus*		r	r	r	Y
American coot	*Fulica americana*	c	o		c	N

Plovers						
Semipalmated plover	*Charadrius semipalmatus*		o	r	o	N
Killdeer	*Charadrius vociferus*	u	c	c	c	Y
Sandpipers						
Dunlin	*Calidris alpina*	r	r		r	N
Least sandpiper	*Calidris minutilla*		u	r	c	N
Pectoral sandpiper	*Calidris melanotos*		r	r	r	N
Semipalmated sandpiper	*Calidris pusilla*		o	r	o	N
Western sandpiper	*Calidris mauri*				r	N
Wilson's snipe	*Gallinago delicata*	o	u		r	N
American woodcock	*Scolopax minor*	o	u	o	u	Y
Spotted sandpiper	*Actitis macularia*		c	o	c	N
Solitary sandpiper	*Tringa solitaria*		o	r	o	N
Greater yellowlegs	*Tringa melanoleuca*	r	c	o	c	N
Lesser yellowlegs	*Tringa flavipes*	r	c	r	c	N
Gulls and Terns						
Bonaparte's gull	*Chroicocephalus philadelphia*	r	u	r	u	N
Laughing gull	*Leucophaeus atricilla*	r	o	o	c	N
Ring-billed gull	*Larus delawarensis*	a	c	o	a	N
Herring gull	*Larus argentatus*	c	u	r	c	N
Lesser black-backed gull	*Larus fuscus*	r				N
Great black-backed gull	*Larus marinus*	u	o		o	N
Least tern	*Sternula anillarum*				r	N
Caspian tern	*Hydroprogne caspia*		o	o	c	N
Black tern	*Chlidonias niger*		r		o	N
Common tern	*Sterna hirundo*				r	N
Forster's tern	*Sterna fosteri*		u	u	a	N
Loons						
Red-throated loon	*Gavia stellata*	r	r		r	N
Common loon	*Gavia immer*	r	u		r	N
Cormorants						
Double-crested cormorant	*Phalocrocorax auritus*	o	c	u	c	N
Bitterns, Herons, and Egrets						
American bittern	*Botaurus lentiginosus*	r	u		r	N
Least bittern	*Ixobrychus exilis*		u	u	r	Y
Great blue heron	*Ardea herodias*	c	a	a	a	Y
Great egret	*Ardea alba*	r	o	c	c	N
Snowy egret	*Egretta thula*		r	r	r	N
Little blue heron	*Egretta caerulea*		r	r	r	N
Cattle egret	*Bubulcus ibis*		r			N
Green heron	*Butorides virescens*		u	c	u	Y
Black-crowned night heron	*Nycticorax nycticorax*	r	r	r	r	N
Yellow-crowned night heron	*Nycticorax violacea*		r	r	r	Y
New World Vultures						
Black vulture	*Coragyps atratus*	o	u	u	u	Y
Turkey vulture	*Cathartes aura*	c	u	c	u	Y
Eagles and Hawks						
Osprey	*Pandion haliaetus*	r	a	a	a	Y
Bald eagle	*Haliaeetus leucocephalus*	a	c	c	c	Y
Northern harrier	*Circus cyaneus*	r	o		o	N
Sharp-shinned hawk	*Accipiter striatus*	o	u	r	u	N
Cooper's hawk	*Accipiter cooperii*	o	o	r	u	Y
Red-shouldered hawk	*Buteo lineatus*	c	c	c	c	Y
Broad-winged hawk	*Buteo platypterus*		o	r	o	Y
Red-tailed hawk	*Buteo jamaicensis*	c	c	u	c	Y
Rough-legged hawk	*Buteo lagopus*	r				N

Owls						
Barn owl	*Tyto alba*				r	Y
Eastern screech-owl	*Megascops asio*	r	r	r	r	Y
Great horned owl	*Bubo virginianus*	u	u	u	u	Y
Barred owl	*Strix varia*	c	c	c	c	Y
Kingfishers						
Belted kingfisher	*Megaceryle alcyon*	u	u	u	u	Y
Woodpeckers						
Red-headed woodpecker	*Melanerpes crythocephalus*	o	r	r	o	Y
Red-bellied woodpecker	*Melanerpes carolinus*	a	a	a	a	Y
Yellow-bellied sapsucker	*Sphyrapicus varius*	o	o		r	N
Downy woodpecker	*Picoides pubescens*	a	a	a	a	Y
Hairy woodpecker	*Picoides villosus*	c	c	c	c	Y
Northern flicker	*Colaptes auratus*	c	c	c	a	Y
Pileated woodpecker	*Dryocopus pileatus*	c	c	c	c	Y
Falcons						
American kestrel	*Falco sparverius*	r	o	r	o	Y
Merlin	*Falco columbarius*	r	r		r	N
Peregrine falcon	*Falco perigrinus*	r	r		o	N
Flycatchers						
Olive-sided flycatcher	*Contopus caperi*		r		r	N
Eastern wood-pewee	*Contopus virens*		u	c	u	Y
Yellow-bellied flycatcher	*Empidonax flaviventris*		r		r	N
Acadian flycatcher	*Empidonax virescens*		c	a	c	Y
Alder flycatcher	*Empidonax alnorum*		r		r	N
Willow flycatcher	*Empidonax taillii*		o	r	o	N
Least flycatcher	*Empidonax minimus*		o		o	N
Eastern phoebe	*Sayoris phoebe*	o	c	u	c	Y
Great-crested flycatcher	*Myiarchus crinitus*		u	c	u	Y
Eastern kingbird	*Tyrannus tyrannus*		o	u	o	Y
Shrikes						
Loggerhead shrike	*Lanius ludovicianus*	r				N
Vireos						
White-eyed vireo	*Vireo griseus*		u	c	u	Y
Yellow-throated vireo	*Vireo flavifrons*		o	o	o	Y
Blue-headed vireo	*Vireo solitarius*		o		o	N
Philadelphia vireo	*Vireo philadelphicus*		r		r	N
Warbling vireo	*Vireo gilvus*		o	r	o	Y
Red-eyed vireo	*Vireo divaceus*		c	a	c	Y
Jays, Crows, and Ravens						
Blue jay	*Cyanocitta cristata*	c	c	c	c	Y
American crow	*Corvus branchyrhynchos*	a	a	a	a	Y
Fish crow	*Corvus ossifragus*	c	c	c	c	Y
Common raven	*Corvus corax*	o	o	o	o	Y
Larks						
Horned lark	*Eremophila alpetris*	r	r		r	N
Swallows						
Purple martin	*Progne subis*		o	o	o	Y
Tree swallow	*Tachycineta bicolor*		c	c	c	Y
Northern rough-winged swallow	*Stelgidopteryx serripennis*		o	u	u	Y
Bank swallow	*Riparia riparia*		o	r	o	Y
Cliff swallow	*Petrochelidon pyrrhonota*		r		r	N
Barn swallow	*Hirundo rustica*		u	u	u	Y

Chickadees and Titmice						
Black-capped chickadee	*Poecile atricapillus*	r				N
Carolina chickadee	*Poecile carolinesis*	a	a	a	a	Y
Tufted titmouse	*Baeolophus bicolor*	a	a	a	a	Y
Nuthatches						
Red-breasted nuthatch	*Sitta candensis*	o	o	r	o	N
White-breasted nuthatch	*Sitta carolinensis*	c	c	c	c	Y
Creepers						
Brown creeper	*Certhia americano*	c	u		u	Y
Wrens						
House wren	*Troglodytes aedon*	r	u	c	u	Y
Winter wren	*Troglodytes hiemalis*	o	r		r	N
Sedge wren	*Cistothorus platensis*		r		r	N
Marsh wren	*Cistothorus palustris*		o	r	o	Y
Carolina wren	*Thryothorus ludovicianus*	a	a	a	a	Y
Gnatcatchers						
Blue-gray gnatcatcher	*Polioptila caerulea*		a	a	c	Y
Kinglets						
Golden-crowned kinglet	*Regulus satrapa*	u	u		u	N
Ruby-crowned kinglet	*Regulus calendula*	u	u		u	N
Thrushes						
Eastern bluebird	*Sialis sialis*	u	a	a	a	Y
Veery	*Catharus fuscescens*		o		o	N
Gray-cheeked thrush	*Catharus minimus*		o		o	N
Swainson's thrush	*Catharus ustulatus*		u		u	N
Hermit thrush	*Catharus guttatus*	u	u		u	N
Wood thrush	*Hylocichla mustelina*		u	c	c	Y
American robin	*Turdus migratorius*	c	a	a	c	Y
Mimics						
Gray catbird	*Dumetella carolinensis*	r	o	u	u	Y
Brown thrasher	*Taxostoma rufum*	r	o	u	u	Y
Northern mockingbird	*Minus polyglottos*	c	c	c	c	Y
Starlings						
European starling	*Sturmus vulgaris*	a	a	a	a	Y
Waxwings						
Cedar waxwing	*Bombycilla cedrorum*	c	u	u	c	Y
Old World Sparrows						
House sparrow	*Passer domesticus*	c	c	c	c	Y
Pipits						
American pipit	*Anthus rubescens*	o	o		r	N
Finches						
House finch	*Haemorphous mexicanus*	a	a	c	c	Y
Purple finch	*Haemorphous purpureus*	o	o		o	N
Pine siskin	*Carduelis pinus*	o	r		r	N
American goldfinch	*Spinus tristis*	c	c	c	a	Y
Red crossbill	*Loxia curvirostra*	r				N
White-winged crossbill	*Loxia leucoptera*	r				N

Warblers						
Ovenbird	*Seiurus aurocapilla*		c	u	c	Y
Worm-eating warbler	*Helmitheros vermivorous*		u	u	u	Y
Louisiana waterthrush	*Parkesia motacilla*		c	u	o	Y
Northern waterthrush	*Parkesia noveboracensis*		o		o	N
Golden-winged warbler	*Vermivora chyrsoptera*		r		r	N
Blue-winged warbler	*Vermivora cyanoptera*		o		o	N
Black and white warbler	*Mniotilta varia*		c	r	c	Y
Prothonotary warbler	*Protonotaria citrea*		c	u	o	Y
Tennessee warbler	*Leiothlypis peregrina*		o		o	N
Orange-crowned warbler	*Vermivora celata*	r				N
Nashville warbler	*Leiothlypis rufucapilla*		o		r	N
Connecticut warbler	*Oporonis agilis*				r	N
Mourning warbler	*Oporonis philadelphia*		r		r	N
Kentucky warbler	*Oporonis formosus*		o	r	o	Y
Common yellowthroat	*Geothylpis trichas*		c	c	c	Y
Hooded warbler	*Setophaga citrina*		o	r	o	Y
American redstart	*Setophaga ruticilla*		c	r	o	Y
Cape May warbler	*Setophaga tigrina*		r		r	N
Cerulean warbler	*Setophaga cerulea*		r		r	N
Northern parula	*Setophaga americana*		c	c	c	Y
Magnolia warbler	*Setophaga magnolia*		u		o	N
Bay-breasted warbler	*Setophaga castanea*		r		r	N
Blackburnian warbler	*Setophaga fusca*		r		r	N
Yellow warbler	*Setophaga petechia*		u	o	u	Y
Chestnut-sided warbler	*Setophaga pensylvanica*		o		o	N
Blackpoll warbler	*Setophaga striata*		c	r	u	N
Black-throated blue warbler	*Setophaga caerulescens*		u		u	N
Palm warbler	*Setophaga palmarum*	r	u		u	N
Pine warbler	*Setophaga pinus*	r	c	u	c	Y
Yellow-rumped warbler	*Setophaga coronata*	u	c		c	N
Yellow-throated warbler	*Setophaga dominica*		u	o	o	Y
Prairie warbler	*Setophaga discolor*		c	c	u	Y
Black-throated green warbler	*Setophaga virens*		u		u	N
Canada warbler	*Cardellina canadensis*		o		o	N
Wilson's warbler	*Cardellina pusilla*		r		r	N
Yellow-breasted chat	*Icteria virens*		u	u	u	Y
Sparrows						
Eastern towhee	*Pipilo erythrophthalmus*	u	c	u	c	Y
American tree sparrow	*Spizella arborea*	o	r			N
Chipping sparrow	*Spizella passerina*	r	u	u	u	Y
Field sparrow	*Spizella pusilla*	c	c	c	c	Y
Vesper sparrow	*Pooecetes gramineus*		o		o	N
Savannah sparrow	*Passerculus sandwichensis*	o	o		o	N
Grasshopper sparrow	*Ammodramus savannarum*		o	u	o	Y
Fox sparrow	*Passerella iliaca*	u	u		r	N
Song sparrow	*Melospiza melodia*	c	c	c	c	Y
Lincoln's sparrow	*Melospiza lincolnii*		r		r	N
Swamp sparrow	*Melospiza georgiana*	u	u		u	N
White-throated sparrow	*Zonotrichia albicollis*	a	c		c	N
White-crowned sparrow	*Zonotrichia leuchophrys*	r	r			N
Dark-eyed junco	*Junco hyemalis*	a	c		c	N

Cardinals, Grosbeaks, and Buntings						
Summer tanager	*Piranga rubra*		u	o	o	Y
Scarlet tanager	*Piranga olivacea*		c	u	c	Y
Northern cardinal	*Cardinalis cardinalis*	a	a	a	a	Y
Evening grosbeak	*Coccothraustes vespertinus*	r				N
Rose-breasted grosbeak	*Pheocticus ludovicianus*		o		o	N
Blue grosbeak	*Passerina caerulea*		o	u	o	Y
Indigo bunting	*Passerina cyanea*		c	a	u	Y
Blackbirds and Orioles						
Bobolink	*Dolichonyx oryzivorus*		r		r	N
Red-winged blackbird	*Agelaius phoeniceus*	c	a	c	c	Y
Eastern meadowlark	*Sturnella magna*	r	u	o	u	Y
Rusty blackbird	*Euphagus carolinus*	o	r		r	N
Common grackle	*Quiscalus quiscalus*	o	a	c	a	Y
Brown-headed cowbird	*Molothrus ater*	o	c	c	c	Y
Orchard oriole	*Icterus spurius*		u	u	o	Y
Baltimore oriole	*Icterus galbula*		u	u	o	Y

* Species are listed in accordance with the American Ornithologists Union (AOU) checklist,
7th edition through the 57th supplement, 2016.

Vagrant Species (seen on Ft Belvoir less than four times)

Western grebe, American white pelican, brown pelican, tricolored heron, glossy ibis, trumpeter swan, mute swan, greater white-fronted goose, cackling goose, Eurasion wigeon, cinnamon teal, tufted duck, black scoter, yellow rail, American avocet, black-bellied plover, American golden-plover, stilt sandpiper, white-rumped sandpiper, upland sandpiper, willet, short-billed dowitcher, long-billed dowitcher, Iceland gull, ring-necked pheasant, Mississippi kite, northern goshawk, golden eagle, short-eared owl, long-eared owl, snowy owl, northern saw-whet owl, common ground dove, vermilion flycatcher, brown-headed nuthatch, Bicknell's thrushBohemian waxwing, Bachman's warbler, black-throated gray warbler, snow bunting, clay-colored sparrow, LeConte's sparrow, Brewer's blackbird

Abundance Codes:
A= Abundant: Numerous individuals, easily seen or heard in suitable habitat
C= Common: Likely to be seen or heard in suitable habitat
U= Uncommon: Possible to see or hear in suitable habitat
O= Occasional: Seasonably possible to see or hear in low numbers in suitable habitat
R= Rare: unlikely to be seen or heard

Common Name	Scientfic Name	Regional Abundance
Turtles		
Common snapping turtle	*Chlydra s. serpentina*	C
Eastern box turtle	*Terrapene c. carolina*	C
Eastern mud turtle	*Kinosternon s. subrubrum*	C
Eastern musk turtle	*Sernotherus odoratus*	C
Painted turtle	*Chrysemys picta*	C
Pond slider turtle	*Trachemys scripta*	C
Redbelly turtle	*Pseudemys rubriventris*	C
River cooter	*Pseudemys concinna*	C
Spotted turtle	*Clemmys guttata*	C
Wood turtle	*Glyptemys insculpta*	U
Red-eared slider	*Trachemys s. elegans*	C
Yellowbelly slider	*Trachemys s. scripta*	U
Snakes		
Black rat snake	*Elaphe o. obsoleta*	C
Corn snake	*Elaphe g. guttata*	H
Eastern gartner snake	*Thamnophis s. sirtalis*	C
Eastern hognose snake	*Heterodon platirhinos*	C
Eastern kingsnake	*Lampropeltis g. getulus*	U
Eastern ribbon snake	*Thamnophis s. sauritus*	C
Eastern rough green snake	*Opheodrys a. aestivus*	C
Eastern worm snake	*Carphophis a. amoenus*	C
Milksnake	*Lampropeltis triangulum*	H
Mole kingsnake	*Lampropeltis c. rhombmaculata*	H
Northern black racer	*Coluber c. constrictor*	C
Northern brown snake	*Storeria d. dekayi*	C
Northern copperhead	*Agkistrodon c. mokeson*	C
Northern redbelly	*Storeria o. occipitomaculata*	U
Northern ringneck snake	*Diadophis p. edwardsi*	C
Northern water snake	*Nerodia s. sipedon*	C
Timber rattlesnake	*Crotalus horridus*	H
Queen snake	*Regina septemvittata*	U
Lizards		
Broad-headed skink	*Plestiodon laticeps*	C
Five-lined skink	*Plestiodon fasciatus*	C
Ground skink	*Scincella lateralis*	C
Northern fence lizard	*Sceloporus u. hyacinthinus*	C

Abundance Codes:
C- Common
U- Uncommon
H- Historical

Fort Belvoir Amphibian Species List

Common Name	Scientific Name	Regional Abundance
Frogs		
American bullfrog	*Lithobates catesbeiana*	C
Cope's gray treefrog	*Hyla v. chrysocelis*	C
Gray treefrog	*Hyla versicolor*	C
Green frog	*Lithobates clamitans*	C
Green treefrog	*Hyla cinerea*	C
Little grass frog	*Pseudacris ocularis*	U
Northern cricket frog	*Acris c. crepitans*	C
Northern spring peeper	*Pseudacris c. crucifer*	C
Pickerel frog	*Lithobates palustris*	C
Southern leopard frog	*Lithobates sphenocephalus*	C
Upland chorus frog	*Pseudacris feriarum*	C
Woodfrog	*Lithobates sylvaticus*	C
Toads		
American toad	*Anaxyrus americanus*	C
Eastern spadefoot	*Scaphiopus h. holbrooki*	H
Fowler's toad	*Anaxyrus fowleri*	C
Salamanders		
Eastern mud salamander	*Pseudotriton m. montanus*	C
Four-toed salamander	*Hemidatylium scutatum*	U
Jefferson salamander	*Ambystoma jeffersonianum*	H
Marbled salamander	*Ambystoma opacum*	C
Northern dusky salamander	*Desmognathus f. fuscus*	U
Northern red salamander	*Pseudotriton r. ruber*	C
Northern two-lined salamander	*Eurycea b. bislineata*	U
Red backed salamander	*Plethodon cinereus*	C
Red-spotted newt	*Notophthalmus viridescens*	U
Spotted salamander	*Ambystoma maculatum*	C
Three-lined salamander	*Eurycea guttolineata*	U
White-spotted slimy salamander	*Plethodon cylindraceus*	U

Abundance Codes:
C- Common
U- Uncommon
H- Historical

Appendix J

Fort Belvoir Bird Checklist

VISITS 1 2 3 4	SPECIES	MONTHS J F M A M J J A S O N D
CREEPERS		
	brown creeper*	
WRENS		
	Carolina wren*	
	house wren*	
	winter wren	
	sedge wren	
	marsh wren*	
KINGLETS & GNATCATCHERS		
	golden-crowned kinglet	
	ruby-crowned kinglet	
	blue-gray gnatcatcher*	
THRUSHES		
	eastern bluebird*	
	veery	
	gray-cheeked thrush	
	Swainson's thrush	
	hermit thrush	
	wood thrush*	
	American robin*	
MIMICS & THRASHERS		
	gray catbird*	
	northern mockingbird*	
	brown thrasher*	
WAXWINGS		
	cedar waxwing*	
SHRIKES		
	loggerhead shrike	
STARLINGS		
	European starling*	
VIREOS		
	white-eyed vireo*	
	blue-headed vireo	
	yellow-throated vireo*	
	warbling vireo*	
	Philadelphia vireo	
	red-eyed vireo*	
WARBLERS		
	blue-winged warbler	
	golden-winged warbler	
	Tennessee warbler	
	orange-crowned warbler	
	Nashville warbler	
	northern parula*	
	yellow warbler*	
	chestnut-sided warbler	
	magnolia warbler	
	Cape May warbler	
	black-throated blue warbler	
	black-throated green warbler	
	blackburnian warbler	
	yellow-rumped warbler	
	yellow-throated warbler*	
	pine warbler*	
	prairie warbler*	
	palm warbler	
	bay-breasted warbler	

VISITS 1 2 3 4	SPECIES	MONTHS J F M A M J J A S O N D
	blackpoll warbler	
	cerulean warbler	
	black & white warbler*	
	prothonotary warbler*	
	worm-eating warbler*	
	Kentucky warbler*	
	Connecticut warbler	
	mourning warbler	
	hooded warbler*	
	Wilson's warbler	
	Canada warbler	
	American redstart*	
	ovenbird*	
	northern waterthrush	
	Louisiana waterthrush*	
	common yellowthroat*	
	yellow-breasted chat*	
TANAGERS		
	summer tanager*	
	scarlet tanager*	
CARDINALS & GROSBEAKS		
	northern cardinal*	
	evening grosbeak	
	rose-breasted grosbeak	
	blue grosbeak*	
	indigo bunting*	
SPARROWS		
	eastern towhee*	
	American tree sparrow	
	chipping sparrow*	
	field sparrow*	
	vesper sparrow	
	Savannah sparrow	
	fox sparrow	
	song sparrow*	
	Lincoln's sparrow	
	swamp sparrow	
	white-throated sparrow	
	white-crowned sparrow	
	house sparrow*	
	dark-eyed junco	
BLACKBIRDS & ORIOLES		
	bobolink	
	red-winged blackbird*	
	eastern meadowlark*	
	rusty blackbird	
	common grackle*	
	brown-headed cowbird*	
	orchard oriole*	
	Baltimore oriole*	
FINCHES & CROSSBILLS		
	purple finch	
	house finch*	
	American goldfinch*	
	red crossbill	
	white-winged crossbill	
	pine siskin	

VAGRANTS

- western grebe
- tricolored heron
- cattle egret
- glossy ibis
- trumpeter swan
- mute swan
- greater white-fronted goose
- cackling goose
- Eurasian wigeon
- cinnamon teal
- tufted duck
- black scoter
- yellow rail
- black-bellied plover
- American golden-plover
- stilt sandpiper
- white-rumped sandpiper
- upland sandpiper
- willet
- short-billed dowitcher
- long-billed dowitcher
- Thayer's gull
- ring-necked pheasant
- Mississippi kite
- northern goshawk
- golden eagel
- short-eared owl
- long-eared owl
- snowy owl
- northern saw-whet owl
- common ground dove
- vermilion flycatcher
- common raven
- brown-headed nuthatch
- Bohemian waxwing
- Bachman's warbler
- black-throated gray warbler
- snow bunting
- grasshopper sparrow*
- Le Conte's sparrow

JACKSON MILES ABBOTT

This checklist is dedicated to the memory of Lieutenant Colonel Jackson Miles Abbott for his great interest in the birds of the Fort Belvoir area. He made important and lasting contributions to the field of ornithology, particularly his 30-year survey of the nesting success of the bald eagle. This survey proved invaluable in relating the eagle decline to the use of pesticide dicholordiphenyl trichloroethane (DDT) and played an important role in having it banned on a national level. This aided in the return of the bald eagle as a year-round resident ar breeding bird at Fort Belvoir.

EDITORIAL NOTES

Many areas of Fort Belvoir are restricted or have limited access. Before going afield in areas other than the established trail system of the Accotink Bay Wildlife Refuge or the Jackson Miles Abbott Wetland Refuge, contact the Environmental and Natural Resource Division (ENRD) for permission.

US Army Garrison Fort Belvoir
Directorate of Public Works
Environmental and Natural Resource Division
9430 Jackson Loop, Fort Belvoir, Virginia 22060
(703) 806-4007

This list is edited and published by the ENRD. Please send any comments, corrections or new observations (especially nesting notes) to this office to aid in future revisions.

Photography and Revisions by:
Gregory W. Fleming

February 2005

CHECKLIST OF BIRDS IN THE FORT BELVOIR, VIRGINIA AREA

Fort Belvoir, an 8,656-acre Army installation along the Potomac River shoreline, affords excellent opportunities for year-round birding. Approximate one quarter of the Installation's land area is designated as Wildlife Refuge or Forest and Wildlife Corridor, resulting in the conservation of a variety of ecologically significant habitats, includin freshwater tidal marsh, grassland, bottomland hardwood forest and upland forest. More than 27(species of birds have been recorded at Fort Belvoir, attesting to the effectiveness of the Installation's natural resource management program.

Environmental and Natural Resource Division

Directorate of Public Works
Fort Belvoir, Virginia

Visits	Date	Time	Weather Conditions
1			
2			
3			
4			

When birding on Fort Belvoir, please follow the Birding Code of Ethics:

1. Exercise restraint and caution during observation, photography, recording or filming.
2. Avoid the use of recordings and other methods of attracting birds.
3. Keep well back from nests and nesting colonies, roosts, display areas and important feeding sites.
4. Stay on trails and keep habitat disturbance to a minimum.
5. Follow all regulations governing the use of roads and public areas.
6. Respect the interests and rights of all other persons participating in other legitimate outdoor activities on the installation.

RELATIVE ABUNDANCE

- ━━━ Abundant: numberous individuals, easily seen or heard in suitable habitat
- ━━━ Common: likely to be seen or heard in suitable habitat
- ——— Uncommon: possible to see or hear in suitable habitat
- - - - - - Occasional: seasonally possible to see or hear in low numbers in suitable habitat
- – – – – Rare: unlikely to be seen or heard
- * Species which nests or has nested on Fort Belvoir

VISITS 1 2 3 4	SPECIES	MONTHS J F M A M J J A S O N D
LOONS		
	red-throated loon	– – – – – – – – – – – –
	common loon	━ ━ ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
GREBES		
	pied-billed grebe	━ ——— ——— ——— – – – – ——— ——— ——— ——— ———
	horned grebe	– ━ ━ – – ——— ——— ——— – – ——— ——— ———
	red-necked grebe	——— ——— ——— ——— ——— ——— ——— – – – ——— ———
CORMORANT		
	double-crested cormorant	– – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
BITTERNS & EGRETS		
	American bittern	– – ——— ——— ——— – – – ——— ——— ——— ——— ———
	least bittern*	——— ——— ——— ——— ——— ——— ——— ——— – – – ——— ———
	great egret	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	snowy egret	——— ——— ——— – – – – – ——— ——— – – ———
HERONS & NIGHT-HERONS		
	great blue heron*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	little blue heron	——— ——— ——— – – – – ——— ——— ——— – – ———
	green heron*	– – – ——— ——— ——— ——— ——— ——— ——— – – –
	black-crowned night-heron	– – – – – ——— ——— ——— ——— ——— ——— ——— ———
	yellow-crowned night-heron*	——— ——— – – – – – – – ——— ——— ——— ——— ———
SWANS & GEESE		
	tundra swan	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Canada goose*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	snow goose	– – ——— ——— ——— ——— ——— ——— ——— ——— – – –
DUCKS		
	wood duck*	━ ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	green-winged teal	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	blue-winged teal	– – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	American black duck*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	mallard*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	northern pintail	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	northern shoveler	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	gadwall	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	American wigeon	– – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	redhead	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	canvasback	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	ring-necked duck	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	greater scaup	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	lesser scaup	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	long-tailed duck	– – – ——— ——— ——— ——— ——— ——— ——— ——— ———
	common goldeneye	– ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	bufflehead	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	hooded merganser*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	common merganser	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	red-breasted merganser	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	ruddy duck	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	surf scoter	– – ——— ——— ——— ——— ——— ——— ——— ——— – –
	white-winged scoter	– – ——— ——— ——— ——— ——— ——— ——— ——— – –
RAILS & COOTS		
	king rail*	– – – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Virginia rail*	– – – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	sora	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	common moorhen*	——— ——— – – – – – – – ——— ——— ——— ——— ———
	American coot	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———

VISITS 1 2 3 4	SPECIES	MONTHS J F M A M J J A S O N D
PLOVER		
	semipalmated plover	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	killdeer*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
SANDPIPERS		
	greater yellowlegs	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	lesser yellowlegs	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	solitary sandpiper	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	spotted sandpiper	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	semipalmated sandpiper	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	western sandpiper	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	least sandpiper	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	pectoral sandpiper	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	dunlin	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Wilson's snipe	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	American woodcock*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
GULLS & TERNS		
	laughing gull	– – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Bonaparte's gull	– – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	ring-billed gull	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	herring gull	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	great black-backed gull	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	lesser black-backed gull	– – – ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Caspian tern	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	common tern	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Forster's tern	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	black tern	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	least tern	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
TURKEYS & QUAILS		
	wild turkey*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	norhern bobwhite*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
VULTURES		
	black vulture*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	turkey vulture*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
EAGLES & HAWKS		
	osprey*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	bald eagle*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	northern harrier	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	sharp-shinned hawk	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Cooper's hawk*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	red-shouldered hawk*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	broad-winged hawk*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	red-tailed hawk*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	rough-legged hawk	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
FALCONS		
	American kestrel*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	merlin	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	peregrine falcon	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
OWLS		
	eastern screech-owl*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	great horned owl*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	barred owl*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	barn owl*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
DOVES		
	rock pigeon*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	mourning dove*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———

VISITS 1 2 3 4	SPECIES	MONTHS J F M A M J J A S O N D
CUCKOOS		
	black-billed cuckoo	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	yellow-billed cuckoo*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
GOATSUCKERS		
	common nighthawk	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	chuck-will's-widow	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	whip-poor-will*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
SWIFTS		
	chimney swift*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
HUMMINGBIRDS		
	ruby-throated hummingbird*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
KINGFISHERS		
	belted kingfisher*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
WOODPECKERS		
	red-headed woodpecker*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	red-bellied woodpecker*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	yellow-bellied sapsucker	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	downy woodpecker*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	hairy woodpecker*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	northern flicker*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	pileated woodpecker*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
FLYCATCHERS		
	olive-sided flycatcher	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	yellow-bellied flycatcher	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	Acadian flycatcher*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	alder flycatcher	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	willow flycatcher	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	least flycatcher	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	great-crested flycatcher*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	eastern wood-pewee*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	eastern phoebe*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	eastern kingbird*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
PIPITS		
	American pipit	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
LARKS		
	horned lark	– – – – – – – – – – – –
SWALLOWS		
	purple martin*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	tree swallow*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	northern rough-winged swallow*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	bank swallow*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	cliff swallow	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	barn swallow*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
JAYS & CROWS		
	blue jay*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	American crow*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	fish crow*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
CHICKADEES & TITMICE		
	black-capped chickadee	– – – – – – – – – – – –
	Carolina chickadee*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	tufted titmouse*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
NUTHATCHES		
	red-breasted nuthatch	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———
	white-breasted nuthatch*	——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ——— ———

Appendix K

Natural Heritage Inventory and Natural Heritage Zoological Inventory of U.S. Army Fort Belvoir

Keough
(desk copy)

COMMONWEALTH of VIRGINIA

A Natural Heritage Inventory of U.S. Army Fort Belvoir

Submitted to:
United States Department of the Army
Directorate of Public Works - Environmental and
Natural Resources Division, Fort Belvoir, Virginia

Virginia Department of Conservation and Recreation
Division of Natural Heritage
Natural Heritage Technical Report 96-03
February, 1996

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

Hobson, 1996

RARE PLANT COMMUNITITES MAPPED by VIRGINIA NATURAL HERITAGE INVENTORY on FORT BELVOIR

SOURCE: McCOY AND FLEMING, 2000

FIGURE: 12.2

ACKNOWLEDGMENTS

Funding for this natural heritage inventory was provided by the Department of the Army and administered through The Nature Conservancy. In bringing this contract to completion, the author wishes to thank all of the staff members of the Environmental Division at Fort Belvoir for their assistance, and those personnel involved with the administration of this contract through The Nature Conservancy. Special thanks go to Dorothy Keogh, John Phillips, Steve Sekcienski and Mike Hudson for their direct assistance with gate keys, access to training areas, site access points, and providing maps and other useful information.

We wish to thank a number of taxonomic experts including Dr. John R. Holsinger, Dr. Joseph C. Mitchell, Dr. Richard L. Hoffman, Dr. Carl H. Ernst, and Dr. Richard J. Neves for their assistance with identifications and taxon specific advice.

Natural Heritage Inventories conducted by the Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH) are a group effort. DCR-DNH field biologists, including the author, planned and conducted all field work. The other DCR-DNH biologists who surveyed Fort Belvoir include: Allen J. Belden, Gary P. Fleming, William H. Moorhead, Thomas J. Rawinski, Steven M. Roble, and Dirk J. Stevenson. Data Management staff, including Lesa Berlinghoff, Tim Berry, Harold Evans, Steve Carter-Lovejoy, Brian Payst, and Megan Rollins assisted in this survey from start to finish, providing lists of potential rare species for the area in the initial stages, processing data on the rare species and significant communities found at Fort Belvoir, and generating figures and tables for the report. Caren A. Caljouw reviewed management and protection recommendations. Leslie D. Trew was responsible for the overall administration and coordination of the contract, while Patricia Jarrell assisted in managing financial matters. Thomas Smith, Division Director, provided support and guidance while overseeing the project from beginning to end. Finally, Faye McKinney held the entire operation together by securing vehicles, coordinating itineraries, completing our travel expense reports, and assisting in many other administrative tasks.

I. INTRODUCTION

INTRODUCTION TO THE INVENTORY PURPOSE, METHODS, AND PROCEDURES

In December, 1988, a Cooperative Agreement was entered into between the Department of Defense (DOD) and The Nature Conservancy (TNC) for the purposes of identifying, documenting, and maintaining biological diversity on DOD installations. Through the Cooperative Agreement, DOD's goal is to obtain technical assistance in techniques for improving management of its natural resources, as well as to gain access to a nationwide network of compatible data which can be used to assess the relative significance of each element of biological diversity found on DOD lands. TNC's goal is to identify, protect, and maintain endangered species and the best examples of exceptional natural areas.

In 1993, the U.S. Army Fort Belvoir Environmental and Natural Resources Division within the Directorate of Public Works contracted with the Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH) to conduct a natural heritage inventory of the base. The goal of this inventory was to systematically identify Fort Belvoir's Natural Heritage Resources: those sites supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural features.

The Virginia Department of Conservation and Recreation's Division of Natural Heritage is the state agency responsible by statutory authority under the Virginia Natural Area Preserves Act (Section 10.1-209 through 217, Code of Virginia) for inventory, database maintenance, protection, and management of Virginia's natural heritage resources. Such resources are defined as the habitats of rare, threatened, or endangered plant and animal species, rare or state significant communities, and other natural features. The Division represents the first comprehensive attempt to identify the Commonwealth's most significant natural areas through ongoing scientific biological survey. Data gathered during this statewide survey are assembled and managed through a sophisticated Biological and Conservation Data System (BCD) in which information on ecosystems and species, their biology, habitats, locations, conservation status, and management needs is continually updated and refined. The Division is part of an international network of natural heritage programs, coordinated by The Nature Conservancy, which uses standardized inventory methodologies and BCD technology.

The intent of the Fort Belvoir Natural Heritage Inventory is to verify and document the presence (or absence), distribution, and population status of specific elements of biological diversity: federally listed threatened or endangered species; proposed candidate species for federal listing; other rare plant and animal species monitored by the DCR-DNH; and communities considered to be rare or exemplary by the DCR-DNH. The practical goal of the inventory is to assist Fort Belvoir personnel in decisions concerning land use, maintenance activities, public access, siting of facilities, and management of areas containing natural heritage resources.

During early 1994, DNH biologists and data managers reviewed existing data in the Biological and Conservation Data System (BCD), in preparation for upcoming field work. Field surveys for rare animals, rare plants and exemplary natural communities were initiated in the spring of 1994 and continued through the fall of 1995. During this period, DNH botanists, zoologists and community ecologists conducted surveys in areas determined to have potential for rare species and significant communities. Overall coordination of the project was through Dorothy Keogh, Steve Sekcienski, and John Phillips of the Environmental Division within the Directorate of Public Works at Fort Belvoir. A progress report detailing information gathered and results of field surveys conducted during 1994 was submitted to Fort Belvoir personnel prior to the initiation of 1995 field surveys. All information gathered during the 1994-95 inventory shall be incorporated into the DCR-DNH Biological and Conservation Data System.

EXPLANATION OF THE NATURAL HERITAGE RANKING SYSTEM

Each of the significant natural features (species, community type, etc.) monitored by the DCR-DNH is considered an element of natural diversity, or simply an **element**. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 1). The primary criterion for ranking elements is the number of occurrences, i.e. the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include condition of the occurrences, number of protected occurrences, and threats. However, emphasis remains on the number of occurrences, so that ranks essentially are an index of known biological rarity. These ranks are assigned in terms of an element's rarity within Virginia (its State or S-rank) and the element's rarity over its entire range (its Global or G-rank). Subspecies and varieties are assigned a Taxonomic (T-) rank in addition to their G-rank. Taken together, these ranks give an instant picture of an element's rarity. For example, a rank of G5/S1 indicates an element which is abundant and secure range-wide, but extremely rare in Virginia. Ranks for community types are provisional or lacking, due to ongoing efforts by the Natural Heritage network to classify community taxa. Rarity ranks used by DNH are not legal designations, and they are continuously updated to reflect new information.

Table 1. Definition of Natural Heritage state rarity ranks. Global ranks are similar, but refer to a species' range-wide status. Note that GA and GN are not used and GX means extinct. Sometimes ranks are combined (e.g., S1S2) to indicate intermediate or somewhat unclear status. Elements with uncertain taxonomic validity are denoted by the letter Q, after the global rank. Ranks for most community types have not been generated due to ongoing community classification efforts. These ranks should not be interpreted as legal designations.

S1	Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.
S2	Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.
S3	Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
S4	Common; usually more than 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
S5	Very common; demonstrably secure under present conditions.
SA	Accidental in the state.
SH	Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.
SN	Regularly occurring migrants or transient species which are non-breeding, seasonal residents. (Note that congregation and staging areas are monitored separately).
SU	Status uncertain, often because of low search effort or cryptic nature of the element.
SX	Apparently extirpated from the state

The spot on the landscape that supports a natural heritage resource is an **element occurrence**. DNH has mapped over 7,000 element occurrences in Virginia. Information on the location and quality of these element occurrences is computerized within the Division's BCD system, and additional information is recorded on maps and in manual files.

In addition to ranking each element's rarity, each element occurrence is ranked to differentiate large, outstanding occurrences from small, vulnerable ones. In this way, protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Species occurrences are ranked in terms of quality (size, vigor, etc.) of the population, the condition (pristine to disturbed) of the habitat, the viability of the population, and the defensibility (ease or difficulty

of protecting) of the occurrence. Community occurrences are ranked according to their size and overall natural condition. These **element occurrence ranks** range from A (excellent) to D (poor). Sometimes these ranks are combined to indicate intermediate or somewhat unclear status (e.g., AB or CD, etc.). In a few cases, especially those involving cryptic animal elements, field data may not be sufficient to reliably rank an occurrence. In such cases a rank of E (extant) may be given. Element occurrence ranks reflect the current condition of the species' population or community. A poorly-ranked element occurrence can, with time, become highly-ranked as a result of successful management or restoration.

Element ranks and element occurrence ranks form the basis for ranking the overall significance of sites. Site **biodiversity ranks** (B-ranks) are used to prioritize protection efforts, and are defined as follows:

B1 Outstanding Significance: only site known for an element; an excellent occurrence of a G1 species; or the world's best example of a community type.

B2 Very High Significance: excellent example of a rare community type; good occurrence of a G1 species; or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

Note: sites supporting rare subspecies or varieties are considered slightly less significant than sites supporting similarly ranked species.

The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered and threatened species under the Endangered Species Act of 1973, as amended. Federally listed species (including subspecific taxa) are afforded a degree of legal protection under the Act, and therefore sites supporting these species need to be highlighted. USFWS also maintains a review listing of potential endangered and threatened taxa known as candidate species and species of concern. Table 2 illustrates the various status categories used by USFWS and followed in this report. The status category of species is based largely on the Service's current knowledge about the biological vulnerability and threats to a species.

In Virginia, two acts have authorized the creation of official state endangered and threatened species lists. One act (section 29.1-563 through 570, Code of Virginia), administered by the

Virginia Department of Game and Inland Fisheries (VDGIF), authorizes listing of fish and wildlife species, excluding insects. The other act (section 3.1-1020 through 1030, Code of Virginia), administered by the Virginia Department of Agriculture and Consumer Services (VDACS), allows for listing of plant and insect species. In general, these acts prohibit or regulate taking, possessing, buying, selling, transporting, exporting, or shipping of any endangered or threatened species appearing on the official lists. Species protected by these acts are indicated as either listed endangered (LE) or listed threatened (LT). Species under consideration for federal listing are indicated as Species of Concern (SOC).

Table 2. U.S. Fish and Wildlife Service species status codes, with abbreviated definitions.

LE	Listed endangered
LT	Listed threatened
PE	Proposed to be listed as endangered
PT	Proposed to be listed as threatened
S	Synonyms
C	Candidate: status data supports listing of taxon as endangered or threatened, but listing has been delayed by pending proposals of higher priority taxa.
SOC	Species of Concern: evidence of vulnerability, but insufficient status data exists.
3A	Persuasive evidence exists that taxon is extinct.
3B	Name that does not represent a distinct taxon, according to recently published revisions and monographs.
3C	Taxon proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat.

V. SITE REPORTS

INTRODUCTION TO THE SITE REPORTS

To facilitate management and enhance protection of biodiversity within Fort Belvoir, boundaries have been provided for landscape units which merit practical and justifiable recommendation as conservation sites. A conservation site is a natural area that includes one or more element occurrences and has been assigned a biodiversity rank of at least B5. Reports follow for two conservation sites identified during the natural heritage resource inventory. The following standard reporting format is used for each conservation site identified within the survey area.

SITE NAME: Site names typically reflect a geographic locality and, in some cases, a prevalent landscape feature.

SIZE: The approximate acreage within the conservation planning boundary, as determined by planimeter, is given.

BIODIVERSITY RANK: The overall significance of the natural area, in terms of the rarity of natural heritage resources and the quality of their occurrences, is indicated. As described in section I, these ranks range from B1 (very high significance) to B5 (general biodiversity significance).

LOCALITY: The county (or counties) containing the site is listed. All sites within the base are in Fairfax County.

QUADRANGLE: The name of the USGS 7.5' quadrangle(s) that includes the site is listed.

QUADRANGLE CODE: The code used by DNH for the quadrangle is listed. The first five digits of the code represent latitude and longitude (in degrees) of the quadrangle.

LOCATION: Location of the site within the drainage and distance from some geographic landmark is given.

NATURAL HERITAGE RESOURCE SUMMARY TABLE: This field provides a synopsis of the natural heritage resources (rare species and significant communities), together with their status ranks (global, state, USFWS and Virginia legal) and element occurrence ranks.

SITE DESCRIPTION: A brief narrative describing the site, its significant elements, vegetation, habitat, and current land use is presented.

BOUNDARY JUSTIFICATION: The preliminary conservation planning boundary delineated in this report contains all known occurrences of natural heritage resources and adjacent lands

required for their immediate protection. This information field explains the basis for the specific site boundaries.

THREATS: Threats to the site and its natural heritage resources are described. These may include both real, imminent threats and potential threats posed by types of land use activities or other factors that currently are not impacting the site.

MANAGEMENT RECOMMENDATIONS: This field is a summary of the major issues and factors that should be considered in management of the site for its biodiversity and natural heritage resource values. As a rule, generalized recommendations are provided based on potential threats identified during the survey work. The expertise of inventory biologists familiar with each site, as well as input from DNH natural areas program biologists has been utilized in preparing these recommendations. However, within the context of a relatively short-term (two year) inventory effort on large sites, it may be difficult to identify highly specific management strategies. In addition, the management needs of a few element occurrences are so obscure that additional study by experts may be needed. In many cases, monitoring of element occurrences or site factors is recommended to determine the best long-term management practices. In all cases, if land use changes or specific high-impact actions are proposed within a site's boundary, consultation with DNH staff is recommended to assess impacts on the natural heritage resources.

PROTECTION RECOMMENDATIONS: A summary of the actions and priority needed to ensure long-term protection of the site and its elements is provided.

REFERENCES: Pertinent literature and sources cited within the site report are listed.

SITE MAP: The site map, drawn on a copy of the USGS 7.5' quad(s), shows the preliminary conservation planning boundary which contains all known element occurrences and the land determined to be important for long-term maintenance of the elements. The following factors are considered when drawing these boundaries:

- the extent of current and potential habitat for rare species and exemplary natural communities;

- species movement and migration corridors;

- maintenance of surface water quality within the site and the surrounding watershed;

- maintenance of the hydrologic integrity of groundwater resources;

- land intended to mitigate a wide variety of off-site impacts;

- land or activities necessary to preclude or minimize exotic species; and

- land necessary for management activities (e.g., prescribed burning).

IV. INVENTORY RESULTS

The results of the field inventory (Section I) are presented in the following pages of this report. In part V, site reports and maps for 2 areas determined to be conservation-worthy natural areas are presented. In part VI, the overall findings of this inventory are summarized.

Summary of Community Elements

Three significant vegetation communities have been documented at Fort Belvoir. These communities, the number of occurrences, and an indication of their rarity are presented in Table 3.

Table 3. Significant vegetation communities found during 1994-95 DNH inventory at Fort Belvoir, Virginia.

Community type / Status in Virginia	Number of occurrences
Eutrophic semipermanently flooded herbaceous vegetation Fresh tidal marsh. Fairly common globally, but rather uncommon in Virginia. This community is in good to excellent condition with little sign of disturbance, and is one of the better examples of its type in Virginia.	1
Oligotrophic saturated forest Acidic seepage swamp. One of the three occurrences on base is made up of two sub-occurrences. Typified by sphagnum covered hummocks in a matrix of mucky peat, which stays constantly saturated by groundwater flow. This community is widely but locally distributed in Virginia.	3
Submesotrophic forest Beech-Tuliptree-Oak forest. This forest type is represented by variable mature stands of several species of oaks, American beech, and tuliptree with other associates along flatter portions of the occurrence. Community type is common globally and in Virginia, but mature examples are rare.	1

Summary of Plant and Animal Elements

Eleven rare species are known from Fort Belvoir, including seven animal species and four plant species. This includes species known prior to and as a result of the DCR-DNH inventory. New element occurrences documented within the base included 5 animals, 4 plants, and 3 natural communities, as well as several watchlist species (Appendix B). The rare species are summarized in the following tables. Table 4 shows the federal and state listed species while

Table 5 shows the other species monitored by the DCR- DNH recorded at Fort Belvoir. Global and state rarity ranks as well as the number of occurrences known for Fort Belvoir are included.

Table 4. Federal and/or state listed species and candidates for listing found at Fort Belvoir, Virginia.

ELEMENT NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA. LEGAL STATUS	NUMBER OF OCCURRENCES
ANIMALS:					
Haliaeetus leucocephalus Bald Eagle	G4	S2/S3	LT	LT	1
Clemmys insculpta wood turtle	G4	S2		LT	1**

** = no recent records

Table 5. Natural Heritage Elements exclusive of Federal and State listed species found at Fort Belvoir, Virginia, or known previously from the base.

ELEMENT NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA. LEGAL STATUS	NUMBER OF OCCURRENCES
PLANTS:					
Carex vestita a sedge	G5	S2			1*
Lathyrus palustris vetchling	G5	S1			1
Ranunculus ambigens water-plantain spearwort	G4/G5	S2			1 *
Scirpus fluviatilis river bulrush	G5	S1			1 *
ANIMALS:					
Ischnura prognata furtive forktail	G4	S2/S3			1
Ixobrychus exilis Least Bittern	G5	S2			1
Nehalennia gracilis sphagnum sprite	G5	S2			1
Neurocordulia obsoleta umber shadowfly	G4	S2			1
Utterbackia imbecillis= *Anodonta imbecillis* paper pondshell	G5	S2			1

* = suboccurrences included

The boundaries are intended for conservation planning purposes and, at the very least, should prevent inadvertent damage to the natural areas.

ELEMENT LOCATION MAPS: Maps showing the exact location of each element occurrence within a site are included following the Site Map. In the case of animal elements, which are often highly mobile organisms, the maps indicate where actual collections were made and/or specimens were observed. These location maps are intended to provide resource managers with requisite site-specific information. However, since rare species are often sensitive to disturbance or may be sought out by collectors, we strongly recommend that this information not be shared with the general public or with persons not directly involved in the stewardship of these sites.

COMMONWEALTH of VIRGINIA

A NATURAL HERITAGE ZOOLOGICAL INVENTORY OF U.S. ARMY FORT BELVOIR

Submitted to:
U.S. Department of the Army
Directorate of Public Works
Environmental and Natural Resources Division
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Natural Heritage Technical Report 97-5
February 1997

Hobson, 1997

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

RARE SPECIES MAPPED by VIRGINIA NATURAL HERTIGE INVENTORY on FORT BELVOIR

SOURCE: HOBSON, 1996; 1997

FIGURE: 12.3

I. INTRODUCTION

INTRODUCTION TO THE INVENTORY PURPOSE, METHODS, AND PROCEDURES

In 1993, the U.S. Army Fort Belvoir Environmental and Natural Resources Division within the Directorate of Public Works contracted with the Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH) to conduct a natural heritage inventory of the base. The goal of this inventory was to systematically identify Fort Belvoir's Natural Heritage Resources: those sites supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural features. Hobson (1996) detailed the findings of this multi-disciplinary inventory. Subsequently, in 1996, DCR-DNH was contracted to continue zoological inventory efforts and further assess management needs of the base's rare animal resources and their habitats, providing a more comprehensive data set for base planning and management efforts.

The Virginia Department of Conservation and Recreation's Division of Natural Heritage is the state agency responsible by statutory authority under the Virginia Natural Area Preserves Act (Section 10.1-209 through 217, Code of Virginia) for inventory, database maintenance, protection, and management of Virginia's natural heritage resources. Such resources are defined as the habitats of rare, threatened, or endangered plant and animal species, rare or state significant communities, and other natural features. The Division represents the first comprehensive attempt to identify the Commonwealth's most significant natural areas through ongoing scientific biological survey. Data gathered during this statewide survey are assembled and managed through a sophisticated Biological and Conservation Data System (BCD) in which information on ecosystems and species, their biology, habitats, locations, conservation status, and management needs is continually updated and refined. The Division is part of an international network of natural heritage programs, coordinated by The Nature Conservancy, which uses standardized inventory methodologies and BCD technology.

The intent of this zoological inventory is to verify and document the presence (or absence), distribution, and population status of specific elements of biological diversity: federally listed threatened or endangered species; proposed candidate species for federal listing; and animal species monitored by the DCR-DNH. The practical goal of the inventory is to assist Fort Belvoir personnel in decisions concerning land use, maintenance activities, public access, siting of facilities, and management of areas containing natural heritage resources.

During early 1996, DNH biologists and data managers reviewed existing data in the Biological and Conservation Data System (BCD), and additional scientific literature in preparation for upcoming field work. Field surveys for rare animals were initiated in the spring of 1996 and continued through the fall of 1996. During this period, DNH zoologists conducted surveys in areas determined to have potential for rare animal species. Surveys during this period focused primarily on birds, groundwater invertebrates, rare odonata, and freshwater mussels. Intensive survey of seepage and spring habitats throughout the base was a primary objective of this

SA Accidental in the state.

SH Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.

SN Regularly occurring migrants or transient species which are non-breeding, seasonal residents. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SX Apparently extirpated from the state

The spot on the landscape that supports a natural heritage resource is an **element occurrence**. DNH has mapped over 7,600 element occurrences in Virginia. Information on the location and quality of these element occurrences is computerized within the Division's BCD system, and additional information is recorded on maps and in manual files.

In addition to ranking each element's rarity, each element occurrence is ranked to differentiate large, outstanding occurrences from small, vulnerable ones. In this way, protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Species occurrences are ranked in terms of quality (size, vigor, etc.) of the population, the condition (pristine to disturbed) of the habitat, the viability of the population, and the defensibility (ease or difficulty of protecting) of the occurrence. Community occurrences are ranked according to their size and overall natural condition. These **element occurrence ranks** range from A (excellent) to D (poor). Sometimes these ranks are combined to indicate intermediate or somewhat unclear status (e.g., AB or CD, etc.). In a few cases, especially those involving cryptic animal elements, field data may not be sufficient to reliably rank an occurrence. In such cases a rank of E (extant) may be given. Element occurrence ranks reflect the current condition of the species' population or community. A poorly-ranked element occurrence can, with time, become highly-ranked as a result of successful management or restoration.

Element ranks and element occurrence ranks form the basis for ranking the overall significance of sites. Site **biodiversity ranks** (B-ranks) are used to prioritize protection efforts, and are defined as follows:

B1 Outstanding Significance: only site known for an element; an excellent occurrence of a G1 species; or the world's best example of a community type.

B2 Very High Significance: excellent example of a rare community type; good occurrence of a G1 species; or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

Note: sites supporting rare subspecies or varieties are considered slightly less significant than sites supporting similarly ranked species.

The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered and threatened species under the Endangered Species Act of 1973, as amended. Federally listed species (including subspecific taxa) are afforded a degree of legal protection under the Act, and therefore sites supporting these species need to be highlighted. USFWS also maintains a review listing of potential endangered and threatened taxa known as candidate species and species of concern. Table 2 illustrates the various status categories used by USFWS and followed in this report. The status category of species is based largely on the Service's current knowledge about the biological vulnerability and threats to a species.

In Virginia, two acts have authorized the creation of official state endangered and threatened species lists. One act (section 29.1-563 through 570, Code of Virginia), administered by the Virginia Department of Game and Inland Fisheries (VDGIF), authorizes listing of fish and wildlife species, excluding insects. The other act (section 3.1-1020 through 1030, Code of Virginia), administered by the Virginia Department of Agriculture and Consumer Services (VDACS), allows for listing of plant and insect species. In general, these acts prohibit or regulate taking, possessing, buying, selling, transporting, exporting, or shipping of any endangered or threatened species appearing on the official lists. Species protected by these acts are indicated as either listed endangered (LE) or listed threatened (LT). Species under consideration for federal listing are indicated as Species of Concern (SOC).

Table 2. U.S. Fish and Wildlife Service species status codes, with abbreviated definitions.

LE	Listed endangered
LT	Listed threatened
PE	Proposed to be listed as endangered
PT	Proposed to be listed as threatened
C	Candidate: status data supports listing of taxon as endangered or threatened, but listing has been delayed by pending proposals of higher priority taxa.
SOC	Species of Concern: evidence of vulnerability, but insufficient status data exists.

III. INVENTORY RESULTS

The results of the 1996 field inventory are presented in the following pages of this report. In part IV, a site report and map for one area determined to be a conservation-worthy natural area is presented. Other conservation sites identified during the previous inventory can be found in Hobson (1996). Rare animal species documented at Fort Belvoir during 1996 are presented in Table 3. In part V, rare species known previously or documented during recent DCR-DNH inventory efforts at Fort Belvoir are summarized in Table 4.

Intensive surveys for birds did not reveal the presence of rare species in Accotink Bay and several small marshes on the shoreline of Pohick Bay. The noted absence of rare birds during the 1996 inventory may be due to the secretive nature of the targeted species, and may not represent a total absence of these species in the marsh habitats. Additionally, extraneous noise levels in surrounding areas may have been a factor in reducing the detectability of calling birds.

Seepage habitats are numerous on the base, and were a major focus of this inventory. However, despite intensive surveys in these habitats at various locations, only one site (Area T-17) was found to contain a rare species, the northern Virginia well amphipod (*Stygobromus phreaticus*). Numerous seepage habitats were found to harbor populations of the watchlist Potomac groundwater amphipod (*Stygobromus tenuis*). Two species of amphipods in the genus *Crangonyx* were also recorded from the base, but neither is tracked as an element by DCR-DNH. They were *Crangonyx shoemakeri*, which is widespread and abundant in the Potomac River watershed, and a currently undescribed species of *Crangonyx* which is known from multiple sites in northern Virginia and Maryland.

Table 3. Rare animal species documented at Fort Belvoir, Virginia during 1996.

ELEMENT NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA. LEGAL STATUS	NUMBER OF OCCURRENCES
Lampsilis radiata eastern lampmussel	G5	S2		SC	1
Stygobromus phreaticus Northern Virginia well amphipod	G1	S1			1

A single dead individual of the eastern lampmussel (*Lampsilis radiata*) was found intact, but desiccated, approximately 3 meters from the water line along the Potomac River shoreline south of Dogue Creek Village (Figure 1). This species may be more common in this portion of the Potomac River than is indicated by collections. However, water quality may be a factor in this species' long term survival in this area. Populations of this species occurring within the Potomac River adjacent to Fort Belvoir are under the jurisdiction of the state of Maryland, where *L. radiata* has a state rank of SU (Maryland Natural Heritage Program 1994).

The northern Virginia well amphipod, a blind subterranean species, was collected on 21 May 1996 from a series of small seepages along the eastern slope of training area T-17 (see Site Report in Part IV for maps). Fifteen individuals were collected from saturated leaf litter and detritus within these seepages which emerged approximately 10 feet above the level of the stream. This collection represents the first collection of this species since 1948, and is the only known extant site for the species globally. The two previous collections were taken from wells in Alexandria (1948) and Vienna (1921) (Holsinger 1978). The Fort Belvoir population is an A-ranked occurrence of this G1 S1 species, warranting conservation planning and protection for this site. Information on threats, management and protection recommendations, population status, location, and a site map are provided in the site report in section IV. Attempts to collect *S. phreaticus* at the T-17 seeps during August were unsuccessful. However, the flow rate at these habitats during August was considerably less than in May.

No other rare species were documented on Fort Belvoir during 1996. However, several watchlist species were documented, including a single male tiger spiketail (*Cordulegaster erronea*), numerous individuals of the Potomac groundwater amphipod (*Stygobromus tenuis*), the big bluet (*Enallagma durum*), gray petaltail (*Tachopteryx thoreyi*), and the blue-faced meadowhawk (*Sympetrum ambiguum*). A list of all watchlist animal species documented at Fort Belvoir is presented in Appendix 1.

Appendix L

Northern Long-Eared Bat Management

Informal Conference & Management Guidelines

on the

Northern Long-eared Bat (*Myotis septentrionalis*)

for

Ongoing Operations on Installation Management Command Installations

May 2015

Prepared By:
U.S. Army Environmental Command

Table of Contents

List of Tables:

I. General

A. *Purpose.* Pursuant to Section 7(a)(4) of the Endangered Species Act (ESA), federal action agencies are required to confer with the United States Fish and Wildlife Service (USFWS) if their proposed action is likely to jeopardize the continued existence of a listed species (50 CFR 402.10(a)). Action agencies may also confer with the USFWS if the proposed action may affect a proposed species or proposed critical habitat. Species listed as threatened or endangered under the ESA are afforded protection against "take". After the listing becomes effective, pursuant to Section 7(a)(2) of the ESA, federal action agencies are required to consult with the USFWS if their proposed action may affect the listed species (50 CFR 402.14(a)).

The intent of this informal conference and subsequent consultation is to evaluate military operations and sustainment/enhancement activities on Installation Management Command (IMCOM) installations and facilities that may affect, but are not likely to adversely affect (NLAA) the northern long-eared bat (*Myotis septentrionalis*; NLEB), a species to be listed as threatened under the ESA on 04 May 2015 (USFWS 2015). No additional species are addressed or covered within this action. IMCOM has determined effects and proposes conservation measures to avoid or minimize adverse effects to the NLEB. If USFWS concurs in the resulting conference report, this will be a programmatic informal conference and programmatic informal consultation. Any activities not included in this consultation will be subject to separate section 7(a)(2) consultation after the listing becomes effective.

This evaluation includes: 1) consultation requirements; 2) IMCOM structure; 3) distribution and status of the species; 4) description of Military Missions and Operations; 5) survey results; 6) proposed conservation measures to limit potential impacts from Military operations and activities; and 7) conclusions.

The resulting conference report will serve as guidelines that establish a programmatic baseline for managing the NLEB on applicable IMCOM installations and facilities to avoid likely future conflicts. It can be used in developing management and conservation goals and objectives for the NLEB as part of an installation's Integrated Natural Resource Management Plan (INRMP). An installation INRMP will supplement these guidelines with detailed measures to meet installation-specific NLEB conservation and unique military mission needs. The requirements established for the NLEB in the INRMPs will apply to all activities on the installation.

B. *Applicability.* The programmatic guidelines are applicable to IMCOM installations and areas of operations identified in this document. Some of these IMCOM installations have already completed an informal/formal conference/consultation with their local USFWS Field Office and will not be subject to this programmatic conference but instead retain the requirements within their specific document, unless the requirements are complimentary and/or the installation, in coordination with USFWS, chooses to adopt the conservation measures defined herein. The remaining IMCOM installations identified in this document with no prior USFWS coordination will be subject

to this programmatic conference and consultation. All IMCOM installations outside the known range of the NLEB are not considered in this programmatic document. The overarching intent is to facilitate IMCOM installations ability to utilize the most appropriate conservations measures in regards to NLEB though section 7conference/consultation.

C. *Timeline and Revision.* HQ IMCOM will revise these guidelines as necessary to be consistent with the listing rule of the NLEB, future Recovery Plans, or incorporation of the latest and best scientific data available. This informal conference will cover a period of three years but will be reviewed annually for applicability and continued concurrence between IMCOM & USFWS on its content. During the annual review if there is continued concurrence or if the document needs to be amended IMCOM and USFWS will coordinate according to the guidelines in the conference report. At any time, IMCOM or the USFWS may revoke or revise this programmatic consultation if it is determined that it is not being implemented as intended.

D. *Goal.* This documents intent is to provide programmatic coverage to all IMCOM installations for the training and land management activities and processes that are similar throughout. Additionally it is IMCOM's goal to implement management guidelines that will allow the accomplishment of military missions & sustainment while concurrently developing and implementing methods to assist in the conservation of the NLEB.

II. Additional Conference/Consultation

A. *Conference/Consultation Requirement.* In proposing actions that deviate from these guidelines that "may affect" the NLEB or for actions in which further consultation has been agreed to, IMCOM installations will comply with the conference/consultation requirements of section 7 of the ESA per the implementing regulations at 50 CFR part 402; and Army policies and guidance.

1. *Informal Conference/Consultation.* IMCOM recognizes that informal conference/consultation with the USFWS is critical to resolving potential problems and establishing the foundation to address issues in a proactive and positive manner. For any "may affect" determinations, IMCOM and IMCOM installations will seek to modify proposed actions and work with the USFWS to obtain concurrence on a "may affect, but not likely to adversely affect" (NLAA) determination. Issue resolution through informal conference/consultation is the preferred method.

2. *Formal Consultation.* If implementation of these guidelines is not possible or feasible for a proposed action and adverse affects cannot be avoided, the subject IMCOM installation will initiate formal Section 7 conference/consultation in accordance with the procedures in 50 CFR 402 and applicable Army policies and guidance. For formal consultations, the IMCOM installation will implement the reasonable and prudent measures (RPMs) identified in the Biological Opinion (BO) to ensure no impacts on mission implementation.

B. *Confirmation.* IMCOM will re-initiate consultation on these guidelines if (i) information arises indicating that implementation of the guidelines may not avoid adverse impacts on the NLEB for certain activities; (ii) data/new research endorses inclusion of new, or modification of established, measures in the guidelines that still support a NLAA determination; or (iii) a "take" occurs even though IMCOM is fully implementing the guidelines. IMCOM will notify USFWS within five business days if issues pertaining to (i) and/or (iii) arise, and work with the USFWS on addressing such issues through informal consultation. IMCOM will make the necessary changes to the guidelines, if any, and conduct the necessary internal staffing prior to submitting the revised document to USFWS for concurrence. During this period, the NLAA concurrence will still be valid for the conservation measures not subject to any scrutiny or concern.

C. *Programmatic Informal Consultation Process.* Each IMCOM installation will screen applicable installation activities through an IMCOM/USFWS cooperatively generated checklist to ensure the activity is conducted as described in this BE. For each activity completed under the programmatic informal consultation, each installation will document their activities and actions taken describing how compliance was maintained with the conservation guidelines within this document. IMCOM will collectively report annually to the USFWS on information collected in the annual Army Environmental Database Environmental Quality (AEDB-EQ) data call for actions taken in regards to NLEB at each installation. This informal conference will cover a period of three years but will be reviewed annually for applicability and continued concurrence between IMCOM & USFWS on its content. All other species that require Section 7 consultation or Migratory Bird Treaty Act compliance will be reported in separate documentation by the individual installation if applicable.

D. *Emergency Consultation*. Unpredictable catastrophes such as wildfires, tornados, or significant hurricane damage may present conditions that cannot be anticipated under these guidelines. In the case of a catastrophic event, IMCOM installations will implement these guidelines to the greatest extent possible, but imminent threat to life or property may take precedence. IMCOM installations will record impacts on NLEB habitat and any definitive impacts on bats resulting from the event, and document any actions that were necessary during the event such as creation of fire breaks, removal of hazardous trees, etc. The subject IMCOM installation(s) will initiate emergency consultation with their associated USFWS field office as soon as possible. IMCOM will reevaluate conservation and management requirements, if necessary, to better prepare for the conservation of the NLEB during such unanticipated events.

E. *Endangered Species Act 4(d) Rule*. With a 4(d) rule in place, any actions taken by an agency that are exempted in the 4(d) rule will not require an incidental take statement in a biological opinion. Therefore installations could drastically reduce the consultation timeframes and conservation measures required for forestry activities (including harvest & prescribed burning), prairie management, right of way expansion,

and other activities defined therein by conducting Section 7 Consultation only on activities contained within the 4d Rule.

F. *Other Listed Species*. Other ESA listed Threatened or Endangered species may occur on IMCOM installations listed in this BE. This BE only addresses the NLEB because consultation has already occurred for the other listed or, depending on the IMCOM installation, activities may have no effect on other listed species. Prior to implementing any Conservation Measure identified in this PBE, the IMCOM installation will address and assess impacts of such measures on applicable listed species. Conservation Measures and Reasonable and Prudent Measures of any relevant Biological Opinion(s) will continue to be implemented for listed species on sites subject to this consultation. If necessary, the IMCOM installation will informally consult with the USFWS to address a situation where implementation of a Conservation Measures may affect NLEB or other listed species.

III. Installation Management Command (Action Area).

Military installations particularly those managed by IMCOM have a demonstrated track record of sound natural resource stewardship and management. This demonstrated ability creates some of the most diverse natural resource areas supporting a multitude of rare and imperiled species while seamlessly blending that with the daily needs of advanced military training. It is the blending of these two seemingly contradictory things which continues to be the IMCOM goal as training capability is directly dependent on our ability to maintain the natural infrastructure of Army lands.

The primary purpose of IMCOM installations is to provide for the sustainment, enhancement, and readiness of the U.S. Military. Military training and enhancement activities are generally divided into the following categories: sustainment operations, engineering operations, air operations, water operations, field training operations, live munitions training, demolition, smokes/obscurants, and research, development, testing, and evaluation (RDTE). All of these activities occur in dispersed Training Areas; some of these activities occur in localized Training Areas year-round at all times of the day and night. Natural resource management activities also occur on most IMCOM installations which may include forest management, prairie management, wildlife management, recreation, erosion control, and other land management activities and uses as described in each installations INRMP.

The U.S. Army Command, IMCOM is a federal agency, and as such, must comply with Federal statutes and regulations. IMCOM supports active and reserve military installations worldwide. IMCOM is organized into four regions (Europe, Atlantic, Central, & Pacific), of which the Atlantic and Central Regions are within the range of the NLEB. There are 19 individual Army installations within the Atlantic Region and 6 installations within the Central Region that have the potential for NLEB's. Table 1 below lists each installation, its IMCOM Regions, the State in which it exists, and its approximate size. While there are approximately 809,000 million acres in total for these

installations only 453,000 of that is forested habitat which may or may not be suitable NLEB habitat.

Funding and policy guidance for natural resources management on installations are provided by IMCOM. IMCOM also provides natural resources technical support, and is responsible for tracking projects, quality assurance of compliance documents, and execution of funds. While IMCOM provides support across its installations, the individual installations are relatively autonomous in their completion of day-to-day management of the installation. Therefore some installations have conducted or are in the process of conducting individual Section 7 actions as it relates to their local situation and may not need the programmatic coverage provided by this document.

Table 1: IMCOM Installations Within the Range of the Northern Long-eared Bat.

IMCOM Region	Installation Name	State	Approx. Size (ac)	Approx. Forested (ac)	Indiana or Gray Bat	NLEB	Bat Surveys	Hibernacula <=5 miles	Consultation	WNS Decon
ATL	Aberdeen Proving Ground*	MD	72,500	18,000			scheduled FY15	No	No - poor habitat	NA
ATL	Carlisle Barracks*	PA	500	0						
CEN	Detroit Arsenal*	MI	341	0			None			
ATL (Reserve)	Devens Reserve Training Facility	MA	5,000	4,000	Verified absence	Historic presence	Occasional	No	No	NA
ATL	Fort AP Hill	VA	76,000	66,500	Out of Range	Historic presence	Occasional-in process	No	Informal	No
ATL	Fort Belvoir	VA	8,658	4,300	Indiana	Assumed	By project & Annual	No	Consultation in progress	Developing
ATL	Fort Campbell	KY	102,414	48,200	Indiana & Gray	Present	By project & Annual	Yes and on-site	Informal and Formal with INRMP	Yes
ATL	Fort Detrick*	MD	12,000	82			None	No Known	No	No
ATL	Fort Drum	NY	107,625	74,000	Indiana	Present	Annual	No	Informal and Formal BO	Yes
ATL	Fort George G. Meade	MD	5100	1,700	Out of Range	Assumed	None	No Known	Informal	N/A
ATL	Fort Hamilton*	NY	50	0			None			
ATL	Fort Knox	KY	109,000	81,000	Indiana	Present	Annual	Yes and on-site	Informal and Formal with INRMP	Yes
CEN	Fort Leavenworth	KS	5,600	3,500	Verified absence	Not Detected	Occasional	No Known	No	NA

IMCOM Region	Installation Name	State	Approx. Size (ac)	Approx. Forested (ac)	Indiana or Gray Bat	NLEB	Bat Surveys	Hibernacula <=5 miles	Consultation	WNS Decon
ATL	Fort Lee*	VA	5,376	2,300	Not Detected	Not Detected	Periodic (every 2-3 years)	No	No - poor habitat	Yes
CEN	Fort Leonard Wood	MO	61,000	44,500	Indiana & Gray	Present	Annual	Yes and on-site (Indiana)	Informal	
CEN (Reserve)	Fort McCoy	WI	60,000	45,400	Out of Range	Present	Periodic (every 2-3 years)	Yes	Informal	No
CEN	Fort Riley	KS	100,656	16,400	Out of Range	Verified absence	Annual	No	Informal	Yes
ATL	Joint Base Myer-Henderson Hall*	VA	270	0			None			
ATL	Natick Soldier System Center*	MA	124	0						
ATL	Picatinny Arsenal	NJ	6,400	4,000	Indiana	Present	Occasional	Yes	Informal	Yes
ATL	Redstone Arsenal	AL	38,000	23,900	Gray	Present	By project & Annual	Yes	Informal Consultation	Yes
CEN	Rock Island Arsenal	IL	946	200	Verified absence	Assumed	Periodic (every 2-3 years)	No	Informal Consultation	Developing
ATL	U.S. Army Adelphi	MD	200	120			scheduled FY15	No Known	No	Developing
ATL	U.S. Army Adelphi - Blossom Point*	MD	1,600	1,000			None	No	No - poor habitat	NA
ATL	West Point Military Reservation	NY	16,080	14,000	Possible Historic Presence	Present	Annual	Yes and on-site	Informal Consultation	Yes
Total			809,348	453,102						

* Indicates no habitat or highly unlikely to occur due to unsuitable habitat.

IV. Distribution and Status of the NLEB.

According to the NLEB final rule (USFWS 2015), the bat is known or believed to occur throughout or part of 37 States and the District of Columbia within the US. In Canada it is found from all Provinces from the Atlantic Coast westward to the southern Yukon Territory and eastern British Columbia. The northeast is considered to be the core range of the species and the area that has been hit hardest by white-nose syndrome. Based on hibernacula data, population numbers of NLEB have experienced a decline of approximately 99% in this core area (USFWS 2013). White-nose syndrome is the most severe and immediate threat to NLEB survival, and is the basis for the final listing of the species as threatened IAW ESA sections 3(6) and 4(a)(1) – Factor C: Disease or Predation. Currently, 12 IMCOM installations representing 9 States assume

NLEB presence or have recorded the NLEB potentially occurring on site (Table 1). A few other IMCOM installations have the potential for the NLEB to occur onsite, but surveys have not been completed to date. In general, the status of the species as a whole is declining and the status of the species on various installations ranges from declining in the east to stable in areas where effects of WNS have not yet occurred.

The active season of the NLEB is roughly April – October (USFWS 2015a). However, the spring staging and fall swarming periods can begin earlier in mid-March and extend to late November (USFWS 2014) (refer to Table 2). During the active season NLEBs roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and snags, typically ≥3 inches diameter at breast height (DBH) in over 35 different tree species. They are also known to roost in sheds and barns, but the overwhelming majority of roosts are in trees (USFWS 2014). NLEBs have been known or suspected of occurring on some of the installations listed in Table 1. Tree species such as black and red oak, silver and sugar maples, hickories, American beech, short-leaf pine, hemlock, birch, spruce, etc. ≥3 inches DBH are known to occur on IMCOM installations throughout the range of NLEB. Summer roosting habitat is available and possibly used on these sites.

Table 2: Active Season Dates for the Northern Long-eared Bat based on Table 1 of the Northern Long-Eared Bat Conference Guidance (USFWS 2014). Individual IMCOM installations should confirm dates with their local USFWS Field Office.

State/Region	Active Season
Alabama	Apr 1-Nov 30
Illinois	Apr 1-Nov 15
Kansas	Apr 1-Nov 1
Kentucky	Apr 1-Nov 15
Massachusetts	Contact FO
Maryland	Contact FO
Michigan	Apr 1-Oct 1
Missouri	Apr 1-Nov 15
New Jersey	Apr 1-Nov 15
New York	Apr 1-Oct 30
Pennsylvania	Contact FO
Virginia	Apr 1-Nov 15
Wisconsin	Apr 1 - Oct 15

As described in the final rule (USFWS 2015), NLEBs predominantly overwinter in hibernacula that include caves and abandoned mines. The hibernacula are typically large, with large passages and entrances, relatively constant, cooler temperatures (0 to 9 °C (32 to 48 °F), and with high humidity to such a large degree that droplets of water are often observed on their fur. The NLEB has also been found to overwinter in structures resembling mines and caves such as abandoned railroad tunnels and hydro-electric dam facilities, to name a few. There are only a few known NLEB hibernacula on

or within five miles of the IMCOM installations. Through development of the IMCOM INRMPs and the Army ACUB program, IMCOM installations have a very good knowledge base on hibernacula occurring on the installation or in the local region. This document addresses potential impacts on or conservation of hibernacula and associated swarming and staging areas for known hibernacula on or within 5 miles of an IMCOM installation. More specific information on NLEB seasons by state is depicted in Table 2.

IMCOM installations, described in Table 1, have conducted both project-level and installation-wide bat surveys to support the military mission. Installations will continue to survey at the level necessary to meet their mission requirements and comply with ESA. Installations that have not surveyed will conduct NLEB surveys to determine presence/absence in suitable habitat as funding allows.

More detailed information on the life history and habitat requirements of the NLEB can be found in the 2015 final rule (USFWS 2015).

As used in this BE, known roost trees are defined as trees that NLEBs have been documented as using during the active season (approximately April–October). Once documented, a tree will be considered to be a ‘‘known roost’’ as long as the tree and surrounding habitat remain suitable for NLEB. However, a tree may be considered to be unoccupied if there is evidence that the roost is no longer in use by NLEB (USFWS 2015).

Known, occupied hibernacula are defined as locations where one or more northern long-eared bats have been detected during hibernation or at the entrance during fall swarming or spring emergence. Given the documented challenges of surveying for northern long-eared bats in the winter (use of cracks, crevices), any hibernacula with northern long-eared bats observed at least once, will continue to be considered ‘‘known hibernacula’’ as long as the hibernacula and its surrounding habitat remain suitable for northern long-eared bat. However, a hibernaculum may be considered to be unoccupied if there is evidence (*e.g.,* survey data) that it is no longer in use by following the USFWS Indiana Bat Hibernacula Survey protocols (USFWS 2015).

Refer to the Glossary, Section X, for additional definitions.

V. Activities That Will Not Affect NLEB.

All activities at installations outside the range of the NLEB will result in no effect to the species. Within the range, all activities that occur in unsuitable habitat will result in no effects to the species and do not require the implementation of any conservation measures. The Northern Long-eared Bat Interim Conference and Planning Guidance (USFWS 14) states, “Trees found in highly-developed urban areas (e.g., street trees, downtown areas) are extremely unlikely to be suitable NLEB habitat.” Therefore, IMCOM considers that all sites within highly-developed urban areas that are not within 1000 feet of suitable forested/wooded habitat are excluded from these guidelines and

ESA conference/consultation requirements. Examples of highly-developed areas include but are not limited to: some cantonment areas, some housing areas, industrial areas, highly developed training sites, and developed testing facilities

IMCOM determines that all of the above proposed actions and sites will have "no effect" on the NLEB.

VI. Activities That May Affect NLEB.

For installations that contain habitat elements for the NLEB within its range, as identified in Table 1, IMCOM will adopt the below conservation practices, unless the installation has verified NLEB absence by utilizing the published USFWS Indiana bat (and NLEB) summer survey protocols.

A. Existing Military Training, Firing and Maneuver ranges: Military training activities are generally divided into the following categories: sustainment operations, engineering operations, air operations, water operations, field training operations (such as but not limited to: foot training, bivouacking, etc), live munitions training, demolition, smokes/obscurants, and research, development, testing, and evaluation (RDTE). All of these activities occur in dispersed Training Areas; some of these activities occur in localized Training Areas. Firing and maneuver ranges on IMCOM installations provide training and testing for the M16/M4 weapons family, M249 and M240 series machine guns, M9 and M1911 series pistols, M203 and MK19 grenade launchers, anti-tank weapons, helicopter gunnery, tank firing, 105 mm through 203 mm cannons, tracked and wheeled vehicles, live grenades, demolitions, and other military operations. The NLEB within these active ranges have been repeatedly exposed to loud noises associated with munitions, detonations, and training vehicles. Camp Atterbury (USFWS 2010), Fort Leonard Wood (USFWS 2010), and Fort Drum (USFS 2008) have assessed range and training noise impacts on Indiana bats (*Myotis sodalis*). Fort Leonard Wood monitored radio-telemetered Indiana bats and found that the bats did not avoid active ranges or alter foraging behavior during night-time maneuvers. A 2002 study on Camp Atterbury found that five of eleven Indiana bats tracked with radio transmitters periodically roosted in the impact area (Whitaker & Gummer 2002). Given these findings, along with the abundance and installation-wide distribution of the bats on the sites, they concluded, and USFWS concurred, that sound intensity and duration associated with past training events have not adversely affected Indiana bats due to the bats having become habituated to such stimuli. It is reasonable to believe that the NLEB have also become habituated to ongoing operational noise on existing IMCOM ranges.

Recent studies have indicated that anthropogenic noise can alter foraging behavior and success of bats, including some gleaning species like the NLEB (Bunkley et al., 2015; Schaub et al., 2008; Siemers and Schaub, 2011). Based on the potential that new sound stimuli may affect the NLEB by influencing foraging behavior and success, the relevant IMCOM installation will consult with the USFWS when new

activities are proposed that significantly differ in sound intensity, quantity/duration of noise events, from those described above.

Bats are vulnerable to mortality from vehicle strikes (Siebert and Connor, 1991; Glista and DeVault, 2008; Russell et al., 2009). Collisions with vehicles are documented for the endangered Indiana bat, as well as the NLEB (Russell et al., 2009). In this study, researchers monitored highway crossings of a roost of approximately 23,000 bats, mainly little brown bats (*Myotis lucifigus*). A total of 26,442 occurrences of bats crossing the highway during dusk (10 days) and dawn (six days) were recorded and 29 road-killed bats were found, one being an Indiana bat. In Glista and DeVault (2008), researchers surveyed 158.5 km of roads for mortality of vertebrates. A total of one road-killed bat (eastern red bat, *Lasiurus borealis*) was found during the road mortality detection surveys – travelling at speeds less than 40 km/h). Finally, Siebert and Connor recorded one road-killed bat during their 50 surveys of a 1.6km of highway (U.S. 33 NW of Athens, OH) spanning from June 1987 to August 1988. The Biological Opinion for Construction, Operation, And Maintenance of the U.S. 33 Nelsonville Bypass Road, OH (USFWS 2005), identified vehicle collision as an anticipated take of Indiana bat. Although we might expect bat mortality associated with vehicle collisions to diminish along with road size/traffic volume, the frequency at which bats attempt to cross roads, especially forest species like the NLEB, likely increases as road size and traffic decrease. Effects of vehicle collisions to bats are likely to be discountable regardless of road size, but should be considered that bats may respond differently to different types of roads. However, in contrast to the roads and maneuver sites on IMCOM installations, the stretches of road discussed above have a constant volume of traffic during times of bat activity, and vehicles are travelling at greater speeds than what typically occurs on IMCOM installations. The numbers and intensity of night time maneuvers and vehicle use on IMCOM installations, as well as operating speed of such vehicles, do not rise to the level associated with public highway use. Therefore, the likelihood of bat road mortality occurring during dusk to dawn on IMCOM installations is determined to be discountable.

In conclusion training activities at firing and maneuver ranges are not likely to adversely affect the NLEB.

B. Aircraft Operations. As with ranges, flight training has and continues to occur on multiple IMCOM installations within the range of the NLEB. Studies have shown that helicopters tend to elicit a heightened response compared to fixed-wing aircraft. Even though that may be the case, helicopter training on IMCOM installations usually occurs as hovering operations occurring over fields or other open areas, thus any impacts from noise or downdrafts would be temporary and minimal to roosting bats and trees. For ongoing night time operations, foraging bats will continue to be exposed to sound levels that have been shown not to alter foraging behavior (USFWS 2010). Given that NLEB forages in the canopy layer (USFWS 2013), collision during night time flight operations are very unlikely to occur. Based on the nature and implementation of air operations, and the assumed level of habituation to flight training stimuli, it is determined that sound generated by ongoing training activities at existing ranges is not likely to adversely

affect the NLEB. Similar conclusions were made at Fort Leonard Wood, (3D/I 1996), involving night-time maneuvers; air operations at Fort Drum, (USFWS 2009); and ongoing training activities at Camp Atterbury (USFWS 2010).

If there are any indications that flight training may be adversely impacting bats such as the observation of tree limbs and/or bark being blown off by helicopter downdraft, the applicable IMCOM installation will initiate consultation with their local USFWS field office. Consultation with the appropriate USFWS field office will also occur if flight training activities are introduced to new sites that have new impacts not discussed above, or if there is intensive low level hovering over forested areas during the active season (summer maternity season, and if applicable to the site, spring staging and fall swarming season), or if there is any other change to flight operations that may affect NLEB in a manner significantly different than those described above.

In conclusion, use of aircraft is not likely to adversely affect the NLEB.

C. Military Training Smoke and Obscurants: Smoke/obscurants are used to conceal military movements and help protect troops and equipment in combat conditions. They can be used throughout the Training Area as part of another military operation, or as part of an independent training scenario. Although they would be primarily used during the day, smoke/obscurants may be deployed at night. Training on some IMCOM installations may include, but is not limited to smokes and obscurants such as fog oil, colored smoke grenades, white phosphorous, and graphite smoke. The effects of these smokes and obscurants were assessed in the Fort Drum (USFS 2008;; Army 2014; USFWS 2009; USFWS 2013; USFWS 2015) and Camp Atterbury BAs and associated BOs (USFWS 2010). Research was cited indicating that prolonged dermal and respiratory exposures to these items, except for the graphite smoke, could have adverse effects on roosting and foraging Indiana bats. Given the similar roosting behavior and foraging locations of the NLEB, it is likely they will also be adversely affected by these smokes and obscurants. However, measures can be taken to avoid adverse effects of some smokes.

Camp Atterbury (USFWS 1998) conducted an ecological risk assessment (ERA) to assess which training materials and pesticides may cause adverse effects to Indiana bats. The ERA indicated that chemicals found in M18 colored smoke grenades may cause acute toxicological effects. They determined that Indiana bats roosting within 36 meters of the deployed grenades may inhale unsafe concentrations of M18 colored smoke during a one-minute period following release. To avoid the potential for adverse effects from colored smoke on NLEB, installations will not release M18 colored smoke grenades within 50 meters of forested suitable NLEB habitat during the active season if USFWS protocol surveys have not been completed. However, sites where surveys have been conducted and determined NLEB roost locations, M18 colored smoke grenades will not be used during the NLEB active season within 50 meters of known roost trees, which are described in Section IV of this document. Therefore, by implementing this measure, it is believed the effects of colored smoke on NLEB will be insignificant.

Citing data from a National Research Council's report on the toxicity of military smokes and obscurants, Fort Drum determined that based on the low toxicity on experimental animals, the use of graphite smoke may affect, but is not likely to adversely affect the known and undiscovered maternity colonies of Indiana bats. The USFWS concurred that any adverse effects associated with graphite smoke are discountable or insignificant (USFWS 2009).

In the 2012 Fort Drum BO (USFWS 2012), the USFWS included a table of a number of studies that provided estimates of fog oil concentrations from typical smoke screening operations. The highest level of fog oil recorded was 140 mg/m3, which was the upper level of a range for a 30 minute release that averaged a 51.8 mg/m3 concentration 200 meters from the source. A 120 min release recorded a maximum level of 105 and 102 mg/m3 at 200 and 100 meters, respectively, from the source of release. The COE Engineer Research and Development Center conducted a study to evaluate the health effects of fog oil aerosols in a surrogate species (Red-winged Blackbird) for the Red-cockaded Woodpecker (Driver et al. 2002). Based on the results of the study, they concluded that adult Red-winged Blackbirds can apparently sustain fog oil exposures of about 400 mg/m3 for 4 hours with no detectable adverse effects.

Table 3. 2012 Fort Drum BO of Estimates of Fog Oil Concentrations Resulting From Typical Smoke Screening Operations at Given Distances From the Source.

Study	Distance from source (meters)	Average (mg/m3)	Range (mg/m3)	Maximum (mg/m3)
Lilegren et al. 1988[A]	100	7.7		
	200	3.6		
	400	2.6		
Policastro et al. 1989[A]	25	116		
	100	8		
	200	3		
Driver et al. 1993[B] (30 min release)	100	64.3	27-120	
	200	51.8	7-140	
	400	27.9	1.8-93	
	1000	6.9	1.6-24	
Driver et al. 1993[B] (300 min release)	100	64		
	200	29		
	400	8.7		
	1000	1.6		
Getz et al. 1996 (120 min release)	100	64	25-102	
	200	56	8-105	
	500	46	1.3-90	
	1000	13	0.8-25	
U.S. Army 1997[B]	100	3.8		13.5
	250	3.5		12.7
	500	2.7		11.2
	1,000	1.2		4.3
Department of the Army 1997 (30 min release)	100		0-14	
	1000		0.1-1	

A- Results from studies conducted in the field
B- Results from modeling

Table is summarized from Getz et al. 1996 and ENSR 1999.

The Lethal Concentration (LC)50 of rats for inhalation of fog oil after 3.5 hours was 5,200 mg/m3. Less than 15% of the rats died at 4,000 mg/m3 (NRC 1999). Roosting NLEBs would most likely be exposed to fog oil levels well below those lethal to rats and having no detectable adverse effects on blackbirds. It would appear that release of fog oil at least 100 meter from any known or suspected roost sites would be sufficient to avoid impacts on NLEB. However, in a study conducted on Fort Leonard Wood, it was estimated that Indiana bats within 4,000 m of static smoke training and 7,000 m of mobile smoke training had the potential to inhale unsafe quantities of fog oil (USFWS 2009). To ensure that NLEB are not adversely affected by fog oil will not be released within forested suitable NLEB habitat during the NLEB active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office

White phosphorous (WP) ignites when it is exposed to air and may cause burns. Smoke typically lasts up to 15 minutes. Rats exposed to WP for 15 min/day, 5 days/week for 13 weeks at 1,740 mg/m3 (H_3PO_4) resulted in the death of 32% of the rats within 6 weeks. Rats produced clear signs of irritation when exposed to H_3PO_4 at a concentration of 525 mg/m3 for 60 minutes. Longer term exposure at concentrations of 884 mg/m3 (15 min per day, 5 days per week for 6 or 13 weeks), resulted in slight laryngitis and tracheitis. A similar exposure, but at higher concentrations (H_3PO_4 at 1,742 mg/m3), resulted in wheezing, dyspnea, moderate-to-severe laryngitis and tracheitis, and interstitial pneumonia. No such effects were reported for rats exposed for 15 min per day, 5 days per week for 13 weeks with H_3PO_4 at 280 mg/m3. Reproduction and development of rats showed that higher WP exposure (1,742 mg/m3 for 15 min/day, 5 days/week for 10 weeks) were associated with lower natal weights and had severe effects on survivability (NRC 1999).

It has been estimated that an exposure concentration of WP could reach 202 mg/m3 (H_3PO_4) 100 m downwind from deployment and about 1.4 mg/m3 (H_3PO_4) 5,000 m downwind. It was cited that the EPA does not expect community exposures to be severe at a distance of greater than 300 m; however, particularly susceptible individuals might experience respiratory irritation even at a distance of 5,000 m (NRC 1999).

To avoid the potential for adverse effects WP on NLEB, installations will not release WP within 200 meters of forested suitable NLEB habitat during the active season if USFWS protocol surveys have not been completed. However, sites where surveys have been conducted and determined NLEB roost locations, WP will not be used during the NLEB active season within 200 meters of known roost trees, which are described in Section IV of this document. Therefore, by implementing this measure, the anticipated level of WP at that distance should not expose NLEB to concentrations of H_3PO_4 that would be likely to adversely affect them.

For “other” smokes and obscurants, we cannot negate the potential for adverse affects on NLEB from exposure. Therefore, to avoid any potential for adverse affects, these items will not be employed during the NLEB active season. IMCOM installations will consult with the USFWS if any of these “other” smokes or obscurants are being

considered for release during the NLEB active season and there is scientific evidence to support that such substances can be released in a manner to avoid adverse effects or ensure such effects are insignificant or discountable.

Summary of Conservation Measures for Military Smoke & Obscurants:

1. M18 colored smoke grenades will not be used within 50m of forested suitable NLEB habitat during the NLEB active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

2. M18 colored smoke grenades will not be used within 50m of known roost trees during the active season (see Table 2) after USFWS protocol surveys have been completed or site specific consultation has been completed with the local USFWS Field Office.

3. Fog oil will not be released within forested suitable NLEB habitat during the NLEB active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

4. WP will not be released within 200 meters of forested suitable NLEB habitat during the NLEB active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

5. WP will not be used within 200m of known roost trees during the active season (see Table 2) after USFWS protocol surveys have been completed or site specific consultation has been completed with the local USFWS Field Office.

6. Other smoke/obscurants will not be employed during the NLEB active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

7. No smoke or obscurants will be released within 0.5 miles of known hibernacula outside of the active season as defined in Table 2.

In conclusion military smoke and obscurants may affect, but are not likely to adversely affect the NLEB by implementing the above conservation measures.

D. Construction: Construction projects can include new buildings, building additions, new or upgraded utilities, etc. As part of construction there may be multiple activities including tree removal, site preparation, equipment staging and maintenance areas, etc. On IMCOM installations where NLEB are known (or assumed – no P/A

surveys conducted to date but within range and suitable summer habitat) to roost, tree cutting and clearing for construction projects will occur during the NLEB inactive season (Table 2) or when verified absence has been determined utilizing the published USFWS protocols. If there is a need to remove a single or small cluster of trees during the active season, the installation will follow procedures listed in Section VI.G. below to determine if such removal can be done with insignificant or discountable effects on NLEB. Tree cutting and clearing may cause loss of habitat; however, inactive season tree removal effects would be discountable by following similar conservation measures to the Federal Highway Administration and Federal Railroad Administration's Range-wide Biological Assessment for Transportation Projects for Indiana Bat and NLEB (FHA 2015)

Other construction activities such as site grading, road construction, vertical and horizontal building, and other activities are likely to occur during the NLEB active season during day light hours. Noise and vibrations generated by heavy equipment within or directly adjacent to roosting trees could temporarily disturb roosting bats. For known roost sites, or areas of suitable habitat without verified absence, that are greater than 100m from the construction site, it is anticipated that the intensity of noise and vibration associated with the construction will diminish a sufficient amount to reduce the likelihood of disturbing bats that roost in these particular areas. Also High light levels may deter bats from areas as their nocturnal behavior may have evolved in response to predation risks (Speakman 1991, Sparks et al. 2005). By angling the light away from potential foraging and roosting areas, the area will be darker thus providing bats more protection from predators. By implementing 100 meter buffers around areas of suitable habitat without verified absence, IMCOM determines that such activities "may affect, but not likely to adversely affect" the NLEB in regards to disturbance activities related to construction. Additional coordination will occur for projects within 0.25 miles of known roosts.

Hibernacula may be affected by construction activities if the activity is conducted too close to or during the inactive season. Construction activities such as site grading, road construction, vertical and horizontal building, and other activities are likely to occur during the NLEB inactive season (Table 2) during day light hours. Noise and vibrations generated by heavy equipment within or directly adjacent to hibernacula could temporarily disturb roosting bats. Because all construction activities will occur >0.5 miles from hibernacula during the winter to be included as part of this informal consultation, no direct effects to NLEB will occur. Additional consultation is required for any construction activities <0.5 miles from hibernacula.

In addition, in areas where NLEBs are already subject to noise and vibrations associated with ongoing actions, construction activities occurring in such area would not likely have an adverse effect on NLEBs.

Additionally, site-specific consultation with the local USFWS field office will often be needed to adequately assess the potential direct and indirect effects associated with construction projects. However, across the range of the species no effects are anticipated if construction projects:

1) Are located entirely (including staging areas & construction footprint) beyond 100 m[1] of NLEB suitable summer habitat and 5 mi of hibernacula OR
2) Involve maintenance, alteration, or demolition of bridges/structures without any signs of bats as verified by a trained biologist, pest management specialist, or similar professional individual.

Some projects may occur near or within suitable NLEB habitat, but the project will result in no effects or discountable likelihood of effects even without the implementation of any avoidance or minimization measures, if the proposed project is based on the following:

1) Activities are completely within existing road surfaces (e.g., road line painting).
2) Activities are within existing ROWs or at existing facilities that contain suitable habitat but that do not remove or alter the habitat (e.g., mowing, brush removal).
3) Activities are wetland or stream protection associated with wetland mitigation without any tree removal.
4) Are located in areas with verified absence determined by USFWS protocol surveys[2]

Other projects may occur near or within NLEB suitable habitat which will require the implementation of conservation measures to avoid or minimize impacts to the point of insignificant/discountable for the projects to be included in this programmatic consultation. Construction projects that involve any of the features listed below are not likely to adversely affect NLEBs.

1) Structure Maintenance: during the active season (Table 2) that does not bother roosting bats in any way (e.g., activity away from roosts inside common rooms in structures, normal cleaning and routine maintenance).
2) Bridge Maintenance: during the active season (Table 2) that does not bother roosting bats in any way (e.g., road paving, wing-wall work, work above that does not drill down to the underside of the deck, some abutment, beam end, scour, or pier repair).
3) Structure or Bridge Maintenance: outside the active season that does not alter roosting potential for bats.
4) Tree Removal must occur outside the active season (Table 2) AND must not remove known roosts (as defined herein) AND
    - must be entirely within 100 feet of existing road surfaces in order to have no linear acreage limits; (this would include roads within cantonment , state, local roads, paved roads, and developed hard packed roads, but does not include trails or other travel corridors in training areas)

    OR

[1] Addresses potential for noise/disturbance adjacent to suitable habitat.
[2] See protocols for minimum number of years negative survey results are valid

- if located >100 feet of existing road surfaces, must be limited to no more than 10 acres per project (10 acres is 5% of a 200 acre home range)

The following additional conservation measures will be taken for all construction to further eliminate the potential to affect NLEB:

1. Roost Tree Protection. No known roost trees, as defined herein, will be felled, unless there is a human health and safety concern. If there is a need to remove a known roost tree, the installation will follow procedures listed in Section VI.G. below to determine if such removal can be done with insignificant or discountable effects on NLEB.

2. Construction activities outside of suitable habitat will not occur within 100 meters of any known roost trees without additional site-specific consultation.

3. Construction activities that remove suitable habitat within 0.25 miles of any known roost trees without additional site-specific consultation. Construction activities will also take into account factors such as the surrounding landscape, habitat connectivity, and distance to other roosts, distance to known foraging areas, and any other issue important NLEB.

4. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect known or potential roost trees during the active season (see Table 2), unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

5. Flagging or signs will be used to demarcate areas to be cleared vs. not cleared prior to any construction activities for a given project. Flagging will be removed upon completion of the project.

6. Via Scope of Works, Contracts, Briefings, etc., all personnel responsible for construction activities will be informed about the need to follow design plans, stay within flagging, and minimize impacts to wildlife and other environmental concerns.

7. Outdoor Lighting Minimization. For all future projects, IMCOM will evaluate the use of outdoor lighting and seek to minimize light pollution by angling lights downward or via other light minimization measures.

8. Demolition. If the building has pre-existing known NLEB colonies, then the appropriate environmental personnel of the IMCOM installation must be contacted before demolition is to occur. If during the course of demolition, NLEB are discovered, then all work must cease and USFWS must be immediately contacted. If the structure is safe to leave as is, then it will be left

until after October 15, or until bats have stopped using the structure. If the structure is unsafe and poses a risk to human health and safety, IMCOM will attempt to exclude the bats immediately. If this is not possible, or NLEB are found to be using the structure during the maternity season when pups are not volant, IMCOM will contact USFWS to discuss the most appropriate next course of action.

9. Water Quality BMPs will be established for each construction site in accordance with the appropriate federal laws and state permits.

In conclusion construction & maintenance activities may affect, but are not likely to adversely affect the NLEB by implementing the above screening criteria and conservation measures.

E. Forest management: Forest management includes both even-aged (e.g., clearcutting or shelterwood) and uneven-aged (single tree or group selection) harvest methods to manage forests to support military training, timber production/health, and wildlife habitat creation/enhancement. Environmental conditions (e.g., wet or rocky soils), training requirements, and stand characteristics dictate harvest methods. Forest management practices such as timber harvest and silviculture are essential to maintaining diverse quality forested habitat for both the NLEB and military training. A number of forest management practices occur on military installation such as but not limited to: harvest, thinning, and/or planting operations. Operations that require tree removal have the potential to alter NLEB habitat. In the final listing rule USFWS anticipates that habitat modifications resulting from forest management and silviculture will not significantly affect the conservation of the northern long-eared bat. However, timber harvest operations performed during the species' active season may directly kill or injure individuals.

Removal of trees could have an indirect effect from loss of potential roosting and foraging areas. The degree of potential impact would be dependent on whether the removal is temporary (i.e., timber harvest, to include clearcuts) or permanent (construction). As stated in the proposed listing rule for NLEB (USFWS 2013), studies to date have found that NLEBs show a varied degree of sensitivity to timber harvesting practices and the amount of forest removal occurring varies by State.

The following additional conservation measures will be taken for all forest management activities to further eliminate the potential to affect NLEB:

1. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect known or potential roost trees during the active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office

2. Roost Tree Protection: No known roost trees, as defined herein will be felled, unless there is a human health and safety concern. If there is a need to

remove a known roost tree, the installation will follow procedures listed in Section VI.G. below to determine if such removal can be done with insignificant or discountable effects on NLEB. Clearcutting or similar harvest will not occur within 0.25 mi (250 m) and overstory roost tree removal within 100 meters of documented maternity roost trees without further consultation with the USFWS. Tree thinning/removal will also take into account factors such as the surrounding landscape, habitat connectivity, and distance to other roosts, distance to known foraging areas, and any other issue important to NLEB.

3. Forest Management will not be conducted within 0.5 miles from "known hibernacula" when bats are present during the inactive season. Forest management near hibernacula may affect swarming and staging areas through habitat loss around the hibernacula. Additional site-specific consultation will occur for forest management within 0.5 miles of hibernacula.

4. Tree Removal Acreage Limits:
   - if located >100 feet of existing road surfaces, must be limited to no more than 10 acres of clearcutting (or similar forest practice like seed tree or shelterwood harvest) per project (10 acres is 5% of a 200 acre home range). NOTE: There is no acreage limit for selective harvest practices conducted during winter, as roosting habitat will remain available.

   OR
   - must be entirely within 100 feet of existing road surfaces in order to have no acreage limits; (this would include roads within cantonment , state, local roads, paved roads, and developed hard packed roads, but does not include trails or other travel corridors in training areas)

5. Snag Retention. All snags will be left in silvicultural treatments unless there is a safety concern for the contractor or the military units training in the stands (e.g., maneuver corridors), or unless the treatment is a salvage harvest or clearcut. Snags should be distributed and retained throughout the landscape.

In conclusion forest management activities may affect, but are not likely to adversely affect the NLEB by implementing the above screening criteria and conservation measures.

F. Prescribed Burns: Prescribed fire is used to improve line-of-sight on ranges and observation points for direct and indirect firing, maintain grassland/open shrubland for open maneuver training, reduce fuel accumulation to minimize wildfire risk, and manage species habitat. It is also used as a tool to maintain ecological health of grassland and forested areas and regenerate oak ecosystems. The majority of natural and prescribed fires on IMCOM installations occur in impact or surface danger zone areas, due to live fire training and testing operations. The vegetation that occupy these areas are fire dependent. Other prescribed fires are generally conducted in grasslands

and forests, during the growing and dormant seasons, and all prescribed fires are implemented in accordance with the installation's Integrated Wildland Fire Management Program and State regulations.

Prescribed fire is gaining acceptance as a means of restoring and perpetuating oak (*Quercus*) dominated ecosystems in the eastern U.S. (Dickinson et al., 2010). As stated in the final listing rule (USFWS 2015), a U.S. Forest Service review of prescribed fire and its effects on bats generally found that fire had beneficial effects on bat habitat. Bats are resilient to fire and some species prefer burned areas for foraging and roosting (e.g. Boyles and Aubrey 2005, Loeb and Waldrop 2007). There is little scientific evidence to indicate that fire has adverse effects on NLEB. NLEB roost-switching frequency, distance between successive roosts, and duration of individual roost tree use were similar between fire and control treatment areas (Johnson et al. 2009). Following prescribed fires, NLEB benefit from increased abundance of insects and availability of roost sites (Lacki et al. 2009). During prescribed fire, NLEB have been shown to exit their roosts during the day and switch roosts as necessary to limit their exposure (Dickinson et al. 2009). In fact, most bats are quick and highly vagile so that escape and relocation to unburned areas easily can occur (Carter et al. 2009). However, neonatal bats that cannot fly would be at greater risk to smoke and fire effects than juveniles or adults. Although, exposure of tree roosting bats to carbon monoxide (CO) is unlikely to be a concern when fireline intensity is low (~1.5 m flame length) (Dickinson et al., 2010). In largely forested landscapes, there are infinite amounts of available roosts for alternate use (Carter et al. 2000). During the active season, bats frequently roost-switch but use torpor to conserve energy and extra arousals when bats are in deep torpor are a cause for concern. The maternity roosting season, from 01 June to 31 July when young pups are not Volant, and to a much lesser extent during the active season, is the only time NLEB might be directly affected by prescribed burns to elicit take. During all other times of the year research has shown that NLEB are not adversely affected by burns conducted under prescribed conditions.

Conservation Measures for Prescribed Burning:

1. Not within 0.5 miles from "known hibernacula" when bats are present during the inactive season (see Table 2 for active season).

2. Not within forested suitable NLEB habitat during the active season (see Table 2) unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

3. Prescribed burns will be conducted under a site specific burn plan per the Installation Integrated Wildland Fire Management Plan which is integrated with the ecosystem management goals and objectives of a tripartite approved (IMCOM, State, and USFWS) Integrated Natural Resource Management Plan (INRMP).

4. Time of Day Restriction. Fore prescribed burns not within forested suitable NLEB habitat, whenever possible, all efforts will be made to have all flames extinguished and smoke generation minimized by sunset to reduce potential direct impacts to foraging bats during the active season (see Table 2

5. Containment Measures. For prescribed burns within 100 meters of forested suitable NLEB habitat, make use of naturally occurring firebreaks or, if necessary, establish wet lines to preclude fire from entering the adjacent NLEB habitat during the active season (see Table 2), unless USFWS protocol surveys have been completed to verify absence or site specific consultation has been completed with the local USFWS Field Office.

In conclusion prescribed burning activities may affect, but are not likely to adversely affect the NLEB by implementing the above conservation measures. Additionally prescribed burning is determined to provide an overall beneficial effect to overall habitat quality.

G. Specific Single, Group, or Hazard Tree Removal: Removal of single, multiple, or cluster of trees during the active season in suitable habitat, trees that do not pose a risk to human life or property will be analyzed for signs of bats being present (emergence surveys) prior to removal according to USFWS Indiana bat (and NLEB) summer survey protocols. If NLEB are roosting in such tree(s), the applicable IMCOM installation will consult with their local USFWS field office. If bat species are determined present and immediate removal of the tree(s) is necessary, the tree(s) will be removed in a manner that will minimize impacts on the bats such as first disturbing the tree(s) to cause them to abandon the roost. If there are hazard trees that are considered an imminent threat to human life or loss of property and need to be removed during the active season, the IMCOM installation will remove such trees and inform the USFWS field office of the action only if NLEB are present on the installation and the IMCOM installation will initiate emergency consultation per the procedures in accordance with 50 CFR 402.05.

H. Pesticide Use: All pesticides will be applied in accordance with their label and applicable laws and regulations. All pesticides are also applied in accordance with the installation INRMP and the Integrated Pest Management Plan (IPMP).IMCOM installations will regularly check Protection Bulletins on EPA's Endangered Species Protection Program (ESPP) website to determine whether pesticide use in a certain geographic area may affect NLEB. Limitations on pesticide use will be implemented as required to protect NLEBs in all areas. Application of pesticides in and around buildings or other structures are not likely to have any effect on NLEB. If NLEBs are found roosting in a building, then pesticides will be used sparingly and no foggers will be used in and around the occupied building.

To minimize the exposure of NLEB to pesticide and to keep in from drifting into known roost tree areas or water bodies the following conservation measures will be followed:

Conservation measures for Pesticide use:

1. Only pesticides registered by the EPA and State of use may be applied and only in accordance with their label.

2. Aerial application of pesticide will only occur outside the active season unless additional consultation with the USFWS is accomplished. Aerial applications will occur between the hours of sunrise and one hour before sunset. This will protect foraging bats in undiscovered foraging areas from direct exposure.

3. Whenever possible, herbicides that have low toxicity to mammals will be utilized with the tow behind power blowers. Herbicides that may be somewhat toxic to mammals will be mixed and applied at a rate that should minimize any potential exposure concerns.

4. Application of pesticides from ground mounted vehicles (i.e., ATVs, tractors) that spray chemicals directly onto the ground and do not result in broad dispersal will be conducted at least 100 ft (30 m) from known roost trees during the active season (coordinate with local USFWS field office).

5. Application of pesticides that result in broad dispersal (e.g., tow behind power blowers) will be conducted at least 250 ft (76 m) away from known roost trees during the active season (coordinate with local USFWS field office). Pesticides will be applied between sunrise and one hour before sunset. Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 50 ft (15 m) of known roosts. This measure minimizes the risk of exposure to bats and potential effects from pesticides.

6. Pesticides applied from tow behind power blowers will use appropriate nozzles and drift control additives, and will be applied using low pressure to reduce drift and potential swirling motion from the blower. All efforts will be made to only spray 10 feet from ground level or below.

7. Pesticides will not be applied outdoors when the wind speed exceeds 8 mi/hr for all applications except power mist blowers. Pesticides applied via power mist blower will only be applied with wind speeds <5 mi/hr. This is to reduce the risk of pesticide drift, which could impact water quality or non-target areas. Care will be taken to make sure that any spray drift is kept away from non-target areas and individuals. Additionally, aerial application utilizing helicopters should employ large droplet technology through special nozzles on drop tubes to ensure the herbicide stays on target.

8. If a bat colony is found roosting in a building, then insecticides will be used sparingly and no foggers will be used. This will minimize impacts to roosting northern long-eared bats if they are found within a building.

In conclusion by implementing these conservation measures IMCOM believes the effects on NLEB will be insignificant.

I. Pest Control: IMCOM facilities may have pest control complaints, such as but not limited to bats, moles (order Insectivora), raccoons (*Procyon lotor*), squirrels (order Rodentia), skunks (order Carnivora), woodchucks (order Rodentia), insects, and other such species. Each issue is handled on a case-by-case basis depending on the pest species and the situation. When possible, wildlife will be deterred from areas by removing features that are attractive to the species (e.g. eliminating potential food/nesting sources, plugging openings into buildings, etc.). If deterrence efforts are ineffective, then it may be necessary to set live traps and relocate or euthanize animals, or use lethal control methods such as trapping, shooting, and/ or chemical control. All pest control efforts are performed in accordance with the installation INRMP and the IPMP.

Lethal traps are primarily used for rodents and moles. Adhesive traps are allowable for rodent and insect control in buildings, however, if placed incorrectly, they may inadvertently capture bats. Both adult and juvenile bats are susceptible to capture in glue traps which could result in injury or mortality. To prevent accidental capture of bats, no adhesive traps can be placed in such a manner that they could capture bats. Glue traps will not be placed in any crawl space or attic compartment within buildings or in areas where bats are known to occur. If bats are present within the building, then live traps for rodents will be used instead of glue traps.

If there are large scale infestations of rodents and moles, chemical means may be necessary to effectively manage the outbreak. Bait stations will not be placed where it may be accessible to children or pets and must be monitored to prevent access to non-target animals.

Conservation Measures for Pest Control:

1. No Lethal Control. No lethal control methods are permitted for bats unless there is a suspected human health risk for exposure to rabies or other disease. If individual bats are in buildings and there is no evidence of maternity use, then all efforts will be made to safely capture and release individual bats. Or, the bats will be excluded by establishing one-way valves over the roost's exit (if feasible).

2. Time of Year Restriction for Exclusion. The exclusion will only be done during times of the year when pups are not present or when they are volant (i.e., August - early May). The time of year restriction will minimize the risk of separating mothers from non-volant young, so it will prevent potential pup mortality during exclusion activities. Sealing cracks and crevices in buildings will also be done during the late fall through early spring. Sealing cracks and

crevices prevents bats from entering a building and reduces human/bat conflicts.

3. Adhesive Trap Restrictions. No adhesive traps used for rodents or insects will be placed in such a manner that they could capture bats—glue traps will not be placed in any crawl space or attic compartment within buildings or in areas where bats are known to occur.

4. Chemical Measures. Any use of chemical or insecticides will be utilized in accordance with section "H" above.

In conclusion by implementing these conservation measures IMCOM believes the effects on NLEB will be insignificant in regards to pest control management activities.

J. Recreational Activities: Recreational activities on IMCOM installations typically consist of hunting, fishing, trapping, hiking, mountain biking, camping, horseback riding, wildlife watching, and other consumptive and non-consumptive activities. These activities whether dispersed or concentrated are low impact activities that do not alter the landscape or generate a disturbance that would be considered to affect the NLEB. Continued use of IMCOM installations for these or similar activities is expected to continue without restriction, in accordance with the Sikes Act (16 U.S.C. 670, et seq.). However development of new areas for these activities that would be considered construction or habitat alteration "may affect"; therefore those projects would utilize the conservation measures identified earlier in this document for those actions.

Hunting activities have the potential to directly affect roosting NLEB if a hunter should place a stand in a NLEB roost. Hunters are unlikely to place tree stands in snags due to the instability of snags and the risk that the tree may fall. Thus, NLEB roosting in standing dead trees are not likely to be adversely affected by tree stands during the non-hibernation seasons. Tree stands may disturb roosting NLEB or damage roosts that are located within crevices of live trees or are in a dead tree limb of a live tree. Installment of a tree stand may cause NLEB to abandon the roost. Hunting primarily occurs in the fall-winter when NLEB are moving to the hibernacula or are already in the hibernacula, so NLEB are more likely to roost alone or in small groups within trees or are within the hibernacula. But since hunting typically occurs in seasons when NLEB are less likely to be present, the use of tree stands may affect but is not likely to adversely affect roosting NLEB.

Hunting activities also have the potential to directly affect roosting NLEB if a hunter should shoot at game flying through the air or in a tree and the shot hits a tree containing roosting NLEB. The likelihood of this happening is expected to be extremely rare, given the combination of occurrences that need to come together (i.e., the hunter being in a location suitable for NLEB to be roosting and game birds or waterfowl to be flying, the hunter shooting at the right angle into a tree to hit and kill a NLEB, etc.).

Additionally, most NLEB would presumably be within the hibernacula when the majority of hunting is conducted (October-February).

There is potential that individuals hunting game may shoot into a forested area which has NLEB roosts. Fired projectiles may strike a NLEB roost and remove bark from the tree, rendering the roost unsuitable for future use. Snags are ephemeral in nature and frequently slough bark. NLEB are known to frequently switch roosts assumed because of the fleeting nature of snags. Since strikes of snags are expected to occur infrequently, NLEB are unlikely to be adversely affected by hunting. Thus effects are discountable.

Skeet shooting could potentially result in injury or mortality of a foraging NLEB if skeet shooting was conducted in extreme early morning or at sunset when NLEB may be active. Skeet ranges located adjacent to suitable NLEB summer foraging habitat have a likelihood that a NLEB could be struck during skeet shooting but is highly improbable.

Legal use of Off Road Vehicles (ORV) should have no known indirect effects to NLEB as ORV's will remain on the road at all times and will not damage vegetation in the area. However, unauthorized ORV use off-trail may damage vegetation which can expose the soil to the elements and could lead to increased soil erosion. Soil erosion may lead to declines in water quality. Lower water quality may reduce aquatic insect availability, which are prey for NLEB. In addition, streams/wetlands may be converted overtime into mud pits that are unsuitable for drinking by NLEB. Given the amount of ample water and natural habitat available on IMCOM installations, it is unlikely that ORV use will adversely affect NLEB. Thus, effects are discountable.

Recreational activities that occur in the vicinity of hibernacula are pass through in nature except possibly for stationary hunting. Stationary hunting would only create a disturbance when a shot or shots were fired but no different than the single unlikely instance as with pass through hunting. Additionally as in section "A" noise activities associated with the firing of weapons has been shown to not adversely affect NLEB.

In conclusion, the majority of recreational activities with the exclusion of ORV use, hunting, and skeet shooting, are expected to have no known effects on NLEB. Given the conservation measures for each and remote nature of potential effects, recreational activities may affect but are not likely to adversely affect NLEB.

VII. Additional General Conservation Measures

This section identifies the Conservation Measures (CM) proposed throughout this document that are considered necessary to either avoid adverse affects or to ensure the expected effects are beneficial, insignificant or discountable. Additional CMs are also proposed to promote the conservation of the NLEB.

- IMCOM will use the most current National WNS Decontamination Protocols approved by USFWS for planned activities that involve close or direct contact with bats, their environments, and/or associated materials.
- IMCOM will explore cooperative management efforts with adjacent landowners, if such efforts would complement installation NLEB conservation initiatives and/or support mission implementation.
- IMCOM will explore cooperative NLEB management strategies, solutions, and efforts with other federal, state, and private organizations and landowners in the region.
- IMCOM will seek funding opportunities to conduct USFWS presence/absence surveys on individual installations subject to the availability of funds.
- IMCOM installations will continue to manage their ecosystems to support and enhance military training, testing, & readiness in accordance with their INRMP to retain habitat and biological diversity, and long term sustainability.
- IMCOM & the USFWS will develop a screening criteria check list so individual installations may quickly and categorically apply the above listed measures described in the programmatic process.
- IMCOM will centrally report activities taken by individual installations under this programmatic opinion annually to the USFWS from data gathered through the annual AEDB-EQ installation data call.

VIII Conclusions

A. Northern Long-Eared Bat. Based on IMCOM's intent to follow USFWS guidance on NLEB management, carry out actions as described in Section V, and to implement the conservation measures identified in Section VI, IMCOM has determined that implementation of actions IAW with this document **"may affect, but not likely to adversely affect"** the NLEB as a threatened species listed under the ESA.

B. Request of Conference Report. IMCOM requests that the USFWS review our findings and determinations stated herein and provide a conference report that reflects IMCOM's proposed conservation measures for reducing adverse effects. If necessary, the applicable IMCOM installation(s) will initiate site specific consultation with their USFWS Field Office on activities that are not included in this BE or if there is additional site specific information to suggest alternate conservation measures.

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X. Glossary

Action area - all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action.

Active season – the time period when bats are not in hibernation. This includes spring emergence, young rearing, and breeding (swarming) and is typically from April through October (specific dates are defined by geographical area see Table 2).

Critical habitat - (i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the provisions of the ESA, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the ESA, upon a determination by the Secretary that such areas are essential for the conservation of the species (defined in Section 3 of the ESA).

Emergency - An emergency is a situation involving an act of God, disasters, casualties, national defense or security emergencies, etc., and includes response activities that must be taken to prevent imminent loss of human life or property.

Exfoliating bark - tree bark that peels away from a trunk or a branch of a tree; when a tree dies, plates of bark spring away from the bole of the tree. Some living trees, such as shagbark hickory and white oak, have bark that peels back from the living cambium.

Hibernaculum (plural **hibernacula) -** a site, usually a cave or mine, where any bat species hibernates during the winter (see suitable habitat).

Is likely to adversely affect – the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial.

Known hibernacula – a location where one or more northern long-eared bats have been detected during hibernation or at the entrance during fall swarming or spring emergence. Given the documented challenges of surveying for northern long-eared bats in the winter (use of cracks, crevices), any hibernacula with northern long-eared bats observed at least once, will continue to be considered ‘‘known hibernacula’’ as long as the hibernacula and its surrounding habitat remain suitable for northern long-eared bat. However, a hibernaculum may be considered to be unoccupied if there is evidence (*e.g.,* survey data) that it is no longer in use by northern long-eared bats (USFWS 2015).

Known roost tree – a tree that male or female NLEBs have been documented as using during the active season (approximately April–October). Once documented, a tree will

be considered to be a ‘‘known roost’’ as long as the tree and surrounding habitat remain suitable for NLEB. However, a tree may be considered to be unoccupied if there is evidence that the roost is no longer in use by NLEB (USFWS 2015).

May affect - the appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat.

No effect - the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or designated critical habitat**.**

Not likely to adversely affect (NLAA) - the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species. **Insignificant effects** relate to the size of the impact and should never reach the scale where take occurs. **Discountable effects** are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

Snag - a standing dead (or mostly dead) tree, generally with <10 percent living canopy.

Staging - the departure of bats from hibernacula in the spring, including processes and behaviors that lead up to departure (see suitable habitat).

Suitable habitat - Summer and/or winter habitat that is appropriate for use by NLEB (may be known or unknown in terms of documented use). See most recent summer survey guidance)

- **Winter** (hibernacula) is restricted to underground caves and cave-like structures (e.g.,abandoned mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cooler temperatures (0-9 degrees C) and with high humidity and minimal air currents.

- **Summer** for NLEB consists of the variety of forested/wooded habitats where they roost, forage, and travel. This includes forested patches as well as linear features such as fencerows, riparian forests and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow. May also include structures for roosting (e.g., barn).

- **Spring staging/fall swarming** for NLEBs consists of the variety of forested/wooded habitats where they roost, forage, and travel within 5 miles of a hibernaculum. This includes forested patches as well as linear features

such as fencerows, riparian forests and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow.

Suitable roost tree - any tree in which bats roost when they emerge from the hibernacula. Females gather in maternity colonies and males may roost singly or in small groups. During summer NLEBs roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and snags, typically ≥3 inches dbh.

Survey - a method of sampling, such as mist netting, that provides data concerning the presence/absence of bats at a site; also, the act of enumerating the bats hibernating in a cave or mine. NLEB summer survey guidance can be found at http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html

Swarming - A phenomenon in which, during late summer and autumn, numerous bats are observed entering and exiting entrances to caves and mines, but few, if any, of the bats may roost within the site during the day. Swarming probably is related to fall breeding activities and locating potential hibernation sites. (See suitable habitat).

Take - Take is defined in Section 3 of the ESA as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Torpor – a period of inactivity, with reduced body temperature and metabolism.

Volant - able to fly.

Verified absence - refers to known or suitable habitat determined to be unoccupied at the time of impact by utilizing USFWS approved protocols.

XI. Summary of IMCOM NLEB Programmatic Biological Evaluation Conservation Measures

A) Activities/Areas Not Subject to Conservation Measures:

- Any Activity that occurs outside the known range of the NLEB (see Section V for details)
- Any activity that occurs within the known range of the NLEB but does not contain suitable NLEB habitat. (see Section V for details)
- Any activity in a highly developed urban area that is <1000' from suitable NLEB habitat. (see Section V for details)
- Any area where NLEB absence has been verified by USFWS Protocol survey.
- Any activity that is conducted under a site specific consultation with the local USFWS Field Office.
- All military activities such as but not limited to: air operations, water operations, field training operations, live munitions training, demolition, and research, development, testing, and evaluation (RDTE). (see Section VI-A for details)
- All activities involving the use of aircraft such as but not limited to: fixed wing, rotary wing, drone, etc…(see Section VI-B for details)
- All categories of outdoor recreation such as but not limited to: hunting, fishing, trapping, hiking, mountain biking, camping, horseback riding, wildlife watching, and other consumptive/non-consumptive activities. (see Section VI-J for details)

B) Activities Subject to Conservation Measures:

- Military Training Smoke and Obscurants: (see Section VI-C for details)
  1. M18 colored smoke grenades will not be used within 50m of forested known/presumed occupied NLEB during the active season (see PBE Table 2 Below). Or within 50m of known roost trees during the active season if USFWS protocol surveys have been completed.
  2. Fog oil will not be released within forested known/presumed occupied habitat during the NLEB active season (see PBE Table 2 Below).
  3. WP will not be released within 200 meters of forested known/presumed occupied NLEB during the active season (see PBE Table 2 Below). Or within 200m of known roost trees during the active season if USFWS protocol surveys have been completed.
  4. Other smoke/obscurants will not be employed during the NLEB active season (see PBE Table 2 Below).
  5. No smoke or obscurants will be released within 0.5 miles of known hibernacula outside of the active season as defined in PBE Table 2 Below.

- Construction: (see Section VI-D for details)
  1. If there is a need to remove a single or small cluster of trees during the active season, the installation will follow procedures listed in that section below.
  2. Consult with USFWS for projects within 0.25 miles of known roost trees. Buffers may also take into account factors such as the surrounding landscape, habitat connectivity, and distance to other roosts, distance to known foraging areas.

3. Implement a 0.5 mile buffer around “known” hibernacula where additional consultation is required
4. Conduct structure, sign, utility, & bridge maintenance: during the active season that does not bother roosting bats in any way (e.g., activity away from roosts inside common rooms in structures, normal cleaning and routine maintenance)
5. Tree removal outside the active season (see PBE Table 2 Below), that is entirely within 100’of an existing road surface has no acreage limit. This would include roads within cantonment , state, local roads, paved roads, and developed hard packed roads, but does not include trails or other travel corridors in training areas)
6. Tree removal outside the active season (see PBE Table 2 Below), that is >100’ of an existing road surface has a 10 acre per project limit.
7. Flagging or signs will be used to demarcate areas to be cleared vs. not cleared prior to any construction activities for a given project. Flagging will be removed upon completion of the project.
8. Via Scope of Works, Contracts, etc., all personnel responsible for construction activities will be informed about the need to follow design plans, stay within flagging, and minimize impacts to wildlife and other environmental concerns.
9. Outdoor Lighting Minimization. For all future projects, IMCOM will evaluate the use of outdoor lighting and seek to minimize light pollution by angling lights downward or via other light minimization measures.
10. Demolition. If the building has pre-existing known NLEB colonies, then the environmental contact of the IMCOM installation must be contacted before demolition is to occur. If during the course of demolition, NLEB are discovered, then all work must cease and USFWS must be immediately contacted. If the structure is safe to leave as is, then it will be left until after October 15, or until bats have stopped using the structure. If the structure is unsafe and poses a risk to human health and safety, IMCOM will attempt to exclude the bats immediately. If this is not possible, or NLEB are found to be using the structure during the maternity season when pups are not volant, IMCOM will contact USFWS to discuss the most appropriate next course of action.
11. Water Quality BMPs will be established for each construction site in accordance with the appropriate federal laws and state permits.

- <u>Forest management:</u> (see Section VI-E for details)
  1. IMCOM will screen projects that required tree removal for forest management activities the same as identified for construction.
  2. If there is a need to remove a single or small cluster of trees during the active season, the installation will follow procedures listed in that section below.
  3. Implement a 0.25-mile buffer around known roost trees where additional consultation is required for clearcutting or similar harvest. Buffers will be may also take into account factors such as the surrounding landscape, habitat connectivity, and distance to other roosts, distance to known foraging areas.

4. Implement a 0.5 mile buffer around “known” hibernacula where additional consultation is required.
5. Tree removal outside the active season (see PBE Table 2 Below), that is entirely within 100’of an existing road surface has no acreage limit. This would include roads within cantonment , state, local roads, paved roads, and developed hard packed roads, but does not include trails or other travel corridors in training areas)
6. Clearcutting or similar harvest outside the active season (see PBE Table 2 Below), that is >100’of an existing road surface has a 10 acre per project limit. No acreage limit on selective harvest.
7. Flagging or signs will be used to demarcate areas to be cleared vs. not cleared prior to any forest management activities for a given project. Flagging will be removed upon completion of the project.
8. Snag Retention. All snags will be left in silvicultural treatments unless there is a safety concern for the contractor or the military units training in the stands (e.g., maneuver corridors), or unless the treatment is a salvage harvest or clearcut.

- Prescribed Burns: (see Section VI-F for details)
  1. Will not be conducted within 0.5 miles from “known hibernacula” when bats are present during the inactive season (see Table 2 for active season).
  2. Will not occur within forested suitable NLEB habitat during the active season (see PBE Table 2 Below).
  3. Prescribed burns will be conducted under a site specific burn plan per the Installation Integrated Wildland Fire Management Plan
  4. Whenever possible, all efforts will be made to have all flames extinguished and smoke generation minimized by sunset to reduce potential direct impacts to foraging bats during the active season (see PBE Table 2 Below)
  5. Make use of naturally occurring firebreaks or if necessary, establish wet lines 100m around forested known/presumed occupied NLEB habitat during the active season (see PBE Table 2 Below), to preclude fire from entering, to the maximum extent practicable.

- Specific Single, Group, or Hazard Tree Removal (see Section VI-G for details)
  1. Removal of single, multiple, or cluster of trees during the active season, in areas where there are known roost trees, trees that do not pose a risk to human life or property will be analyzed for signs of bats being present (emergence surveys) prior to removal according to USFWS Indiana bat (and NLEB) summer survey protocols.
  2. If known roost tree removal is determined to be necessary, the applicable IMCOM installation will consult with their local USFWS field office.
  3. If such tree removal is preferred immediately, the applicable IMCOM installation will consult with their local USFWS field office.
  4. If non-ESA bat species are determined present and immediate removal of the tree(s) is necessary, the tree(s) will be removed in a manner that will minimize

impacts on the bats such as first disturbing the tree(s) to cause them to abandon the roost.

5. If there are hazard trees that are considered an imminent threat to human life or loss of property occurring in suitable NLEB habitat and need to be removed during the active season, the IMCOM installation will remove such trees and inform the USFWS field office of the action only if NLEB are present on the IMCOM installation will initiate emergency consultation per the procedures in accordance with 50 CFR 402.05.

- Pesticide Use: (see Section VI-H for details)
  1. Only pesticides registered by the EPA and State of use may be applied and only in accordance with their label.
  2. Aerial applications will occur outside the active season (see PBE Table 2 Below) and between the hours of sunrise and one hour before sunset. When utilizing helicopters for application they should employ large droplet technology through special nozzles on drop tubes to ensure the herbicide stays on target.
  3. Whenever possible, herbicides that have low toxicity to mammals will be utilized with the tow behind power blowers. Herbicides that may be somewhat toxic to mammals will be mixed and applied at a rate that should minimize any potential exposure concerns.
  4. Application of pesticides from ground mounted vehicles (i.e., ATVs, tractors) that spray chemicals directly onto the ground and do not result in broad dispersal will be conducted at least 100 ft (30 m) from known roost trees during the active season (see PBE Table 2).
  5. Application of pesticides that result in broad dispersal (e.g., tow behind power blowers) will be conducted at least 250 ft (76 m) away from known roost trees during the active season (see PBE Table 2 Below) and will be applied between sunrise and one hour before sunset.
  6. Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 50 ft (15 m) of known roosts.
  7. Pesticides applied from tow behind power blowers will use appropriate nozzles and drift control additives, and will be applied using low pressure to reduce drift and potential swirling motion from the blower. All efforts will be made to only spray 10 feet from ground level or below.
  8. Pesticides will not be applied outdoors when the wind speed exceeds 8 mi/hr for all applications except power mist blowers. Pesticides applied via power mist blower will only be applied with wind speeds <5 mi/hr.
  9. If a bat colony is found roosting in a building, then insecticides will be used sparingly and no foggers will be used. This will minimize impacts to roosting northern long-eared bats if they are found within a building.

- Pest Control: (see Section VI-I for details)
  1. No Lethal Control. No lethal control methods are permitted for bats unless there is a suspected human health risk for exposure to rabies or other

disease. If individual bats are in buildings and there is no evidence of maternity use, then all efforts will be made to safely capture and release individual bats. Or, the bats will be excluded by establishing one-way valves over the roost's exit (if feasible).

2. Exclusion will only be done during times of the year when pups are not present or when they are volant (i.e., August - early May). Sealing cracks and crevices in buildings will also be done during the late fall or early spring.
3. No adhesive traps used for rodents or insects will be placed in such a manner that they could capture bats—glue traps will not be placed in any crawl space or attic compartment within buildings or in areas where bats are known to occur.
4. Chemical Measures. Any use of insecticides will be utilized in accordance with the conservation measure associated with "Pesticide Use".

C) Additional General Conservation Measures.

1. IMCOM will use the most current National WNS Decontamination Protocols approved by USFWS for planned activities that involve close or direct contact with bats, their environments, and/or associated materials.
2. IMCOM will explore cooperative management efforts with adjacent landowners, if such efforts would complement installation NLEB conservation initiatives and/or support mission implementation.
3. IMCOM will explore cooperative NLEB management strategies, solutions, and efforts with other federal, state, and private organizations and landowners in the region.
4. IMCOM will seek funding opportunities to conduct USFWS presence/absence surveys on individual installations subject to the availability of funds.
5. IMCOM installations will continue to manage their ecosystems to support and enhance military training, testing, & readiness in accordance with their INRMP to retain habitat and biological diversity, and long term sustainability.
6. IMCOM & the USFWS will develop a screening criteria check list so individual installations may quickly and categorically apply the above listed measures described in the programmatic process.
7. IMCOM will centrally report activities taken by individual installations under this programmatic opinion annually to the USFWS from data gathered through the annual AEDB-EQ installation data call.

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
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REPLY TO
ATTENTION OF

IMBV-PW

21 October 2015

MEMORANDUM FOR US Army Fort Belvoir Personnel

SUBJECT: Memorandum of Instruction — Northern Long-eared Bat Protection on Fort Belvoir

1. PURPOSE. The purpose of this memorandum is to disseminate the requirements for protecting northern long-eared bat (NLEB), a species recently listed as "threatened" under the Endangered Species Act. This memorandum summarizes the protection measures of the Endangered Species Act, as well as the Conservation Measures agreed upon between the US Army Environmental Command and the US Fish and Wildlife Service (FWS) in the "Informal Conference & Management Guidelines on the Northern Long-eared Bat (*Myotis septentrionalis*) for Ongoing Operations on Installation Management Command Installations", May 2015 (i.e., the Programmatic Consultation). This memorandum establishes DPW's sole responsibility for conducting consultation with FWS when required for all activities and operations (projects) and project proponent responsibility for providing DPW all project-specific materials required for the consultation. This memorandum will be revised, as necessary, to reflect any changes resulting from Fort Belvoir's ongoing installation-specific coordination with FWS's Virginia Field Office, and to reflect bat survey results.

2. APPLICABILITY. This memorandum applies to all military, civilian, tenant, partner, and contractor activities on Fort Belvoir.

3. SUMMARY OF NORTHERN LONG-EARED BAT PROTECTION REQUIREMENTS.

The Endangered Species Act requires federal agencies to protect listed species and to consult with FWS (and/or National Marine Fisheries Services) on any action that "may adversely affect" a listed species. Activities at Fort Belvoir with the potential to affect northern long-eared bat include tree cutting or clearing; construction; pest control operations (e.g., pesticide application, removal, or exclusion, of animals from buildings); military training, firing and maneuvering activities; aircraft operations; forest management; and, development of new recreational areas.

Tree Cutting or Clearing.

The Programmatic Consultation establishes a time-of-year restriction (TOYR) prohibiting all tree cutting or clearing of trees 3 inches or greater in diameter at breast

height from 15 April through 15 September (see enclosed FWS message dated 28 May 2015) annually. An exception is possible for trees that pose a hazard to personnel or property, and for removal of individual non-hazardous trees. Such removals must be coordinated through the Fort Belvoir Directorate of Public Works (DPW). For those exceptions, Fort Belvoir must survey and document the absence of northern long-eared bat prior to authorizing removal of any trees during the TOYR period. Individual non-hazardous trees cannot be removed, if northern long-eared bat is present. Hazardous trees may be removed, but Fort Belvoir must initiate emergency consultation with FWS for trees to be removed during the TOYR period, if northern long-eared bat is present.

Consultation with FWS is required for the following actions any time of the year: clearing 10 acres or more of trees (unless the project is entirely within 100 feet of an existing road surface); or clearcutting within 0.25 mile and overstory roost tree removal within 100 meters of a documented maternity roost tree, or within 0.5 mile of a known hibernacula.

DPW has sole responsibility for conducting consultation with FWS when required for all activities and operations (projects). Project proponents will be responsible for providing DPW all project-specific materials required for the consultation.

Construction Activities, Other than Tree Removal.

Project-specific consultation with FWS is required if the project cannot angle the lighting away from a potential bat foraging area, or cannot provide a 100-meter buffer around areas of suitable bat habitat. Consultation is also required for projects within 0.25 mile of a known roost or within 0.50 mile of a known hibernacula. The Programmatic Consultation allows exemptions to these requirements for some situations, such as activities entirely within an existing road surface. All construction must be coordinated with DPW to assess Consultation requirements.

Pest Control Operations.

No glue traps/adhesive traps are to be placed where they could capture bats. No lethal control measures are permitted for bats unless there is a suspected human health risk for exposure to rabies or other disease. The Programmatic Consultation establishes a TOYR prohibiting installation of bat exclusions to buildings from 1 May through 31 August annually, and only allows the sealing of building cracks and crevices from late fall through early spring annually. Insecticides are to be used sparingly in buildings with

bats, and the use of foggers is prohibited. The Programmatic Consultation establishes a Military Training, Firing and Maneuver Activities, and Aircraft Operations.

Any changes to existing military training, firing, or maneuver activities, or to existing flight training activities or aircraft operations must be coordinated with DPW to determine if FWS consultation is required.

Recreational Activities.

Project-specific consultation with FWS is required for the development of new recreation areas.

Other Requirements.

No one is allowed to handle any bats on Fort Belvoir unless they are in possession of the appropriate state and/or federal permits. They also are required to be current on their rabies pre-exposure vaccinations.

4. PROPONENT. The Directorate of Public Works, Environmental and Natural Resource Division (DPW-ENRD) is the proponent for this memorandum. Point of contact for tree work is Brice Bartley at 703-806-4142; point of contact for pest control work is Steve Watters at 703-806-0684; and point of contact for northern long-eared bat Endangered Species Act consultation requirements is Dorothy Keough at 703-806-0049.

Encl

FOR Stephen M. Boehm, Deputy
MICHELLE D. MITCHELL
Colonel, AG
Commanding

Appendix M

Plant and Animal Safety Concerns

U.S. Army Garrison
Fort Belvoir

Plant and Animal Safety Concerns

Directorate of Public Works

Environmental and Natural Resources Division

2017

Concerns on Post

- Poison Ivy, Poison Sumac, Poison Oak
- Tick borne diseases
- Rabies
- Copperhead Snake
- Spiders
- West Nile Virus
- Zika Virus

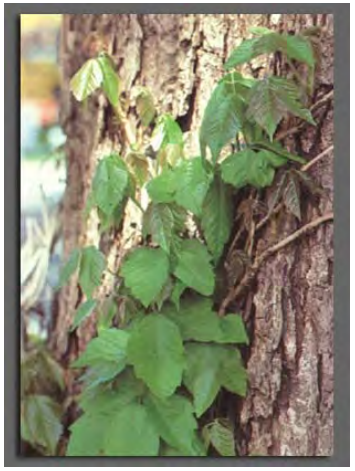
Poison Ivy, Poison Oak, Poison Sumac

- **Poison ivy (Toxicodendron radicans), poison oak (Toxicodendron pubescens), or poison sumac (Toxicodendron vernix) are plants that can cause blisters, swelling, and extreme itching. Although poison oak and poison sumac do grow in Virginia, poison ivy is by far the most common.**
  - Poison ivy can grow as a groundcover or small bush in woods, fields, at the edges of openings and trails, and pretty much everywhere else. Poison ivy also grows as a vine that climbs on trees, barns, and fences for support. The vine has small aerial roots along the stem that make it look like a fuzzy rope and often has much longer aerial roots as well. Because the plant grows in so many different forms, its leaflets are the best way to identify poison ivy. The leaflets grow in clusters of three. Hence the old saying "leaves of three, let it be." These leaflets are from two to four inches long with pointed tips. The middle leaflet is usually larger than the others. The edges of the leaflets don't always look the same. They might be smooth, or they could have teeth. The leaflet surface can be many different shades of green and appear glossy, dull, or in between.
  - Poison sumac is a small tree that primarily grows on moist sites in the southern and eastern parts of the state. There are several other species of sumac that are not poisonous at all.
  - Poison oak is a shrub that grows on dry sites, mainly in eastern Virginia. It is usually less than ten feet tall.

www.ext.vt.edu

Poison Ivy - Visual identification

Leaves of three and expect variety through out the season and locality…



http://poisonivy.aesir.com/view/info.html

Poison Ivy continued

Poison ivy or Virginia creeper?

Virginia creeper can be confused with poison ivy because sometimes it has three leaves instead of the five leaves we recognize in the traditional form.

(Poison ivy on the left and Virginia creeper on the right)

3 separate poison ivy vines growing up a pine tree. Notice the VERY hairy vines. Urushiol is in the vine as well as the leaves - approach with extreme caution!

http://poisonivy.aesir.com/view/info.html

Poison Oak - Visual Identification

- In spring and summer its leaves are shiny green and grouped in threes. "Leaflets three, leave it be!" Little green berries are among the leaves.
- The leaves turn yellow and red in the fall, and the berries are pale yellow.
- In the winter only the stalks and branches of the plant are extant, and even oil from these is virulent.
- The plant may grow as small, isolated shrubs, to great thickets, and in vines that wrap upward and around adjacent trees and shrubs.

http://poisonivy.aesir.com/view/info.html

Poison Sumac – Visual Identification

- Poison sumac is found in some of the wooded swamps of Virginia. Few people are likely to come in contact with it.
- It is a tall shrub or small tree with 6-12 leaflets arranged in pairs, and an additional single leaflet at the end of the midrib.
- The small yellowish green flowers, borne in clusters, mature into whitish green fruits that hang in loose clusters 10-30 cm in length. The male and female flowers of poison sumac are on separate plants, as in poison ivy and western poison oak.
- Although nonpoisonous sumac species have leaves similar to those of poison sumac, the nonpoisonous species have red fruits that form distinctive, erect, cone-shaped terminal heads, not the hanging whitish green fruits of poison sumac.

http://poisonivy.aesir.com/view/info.html

What Causes the Rash?

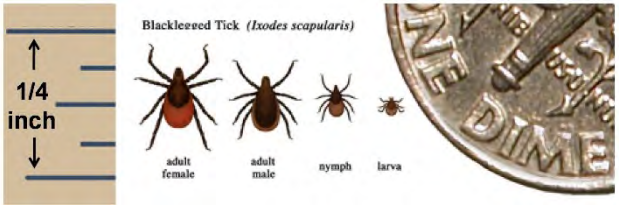
- All parts of these plants, including the roots, stems, bark, and leaflets, are poisonous year round. The blistering rash people get is caused by an oily toxin known as urushiol.
- The most common way this toxin gets on your skin is when you touch the plant, especially one that has been damaged in some way, such as being stepped on or pulled. The toxin is oily and sticky, and is easily spread around when you touch other parts of your body.
- You also can contract the rash by picking up the toxins from animals, clothes, or other items that have been in contact with poison ivy, poison sumac or poison oak. And, if these plants are burned in a brush pile, the resulting smoke carries the toxins. It is very important that you avoid breathing the smoke of burning wood or brush if any of these poisonous plants might be part of the pile.

http://poisonivy.aesir.com/view/info.html

Tick borne Diseases in Virginia

- **The tick borne diseases most often found in Virginia are**
  - **Lyme disease**
  - **Rocky Mountain spotted fever**
  - **Ehrlichiosis**
  - **Alpha-gal allergy (red meat allergy)**
- **If you get sick and you have been exposed to ticks, be sure to tell your doctor about your tick exposure.**

http://www.vdh.state.va.us/epi/tickpage.htm

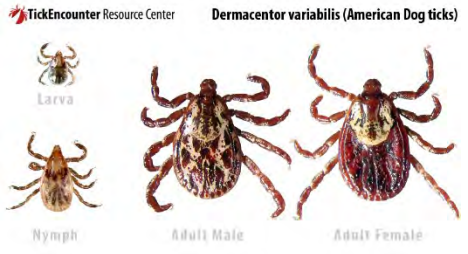


deer tick

Ticks- Lyme disease

- **Lyme disease** is a bacterial illness transmitted by a tick bite. Although the disease is found more frequently in the North and the upper Midwest, it is becoming increasingly common in VA.
- **The deer tick (*Ixodes scapularis*, previously called *Ixodes dammini)*** is the most common carrier of Lyme disease in the eastern United States.
- **Transmission** usually occurs when the nymph is active and feeds on small and large animals, and occasionally on humans. At this stage, the tick is about the size of a pinhead. By fall nymphs become adults which also may transmit the disease.
- Transmission by the nymph or adult usually does not occur until the tick has been **attached for over 1 to 2 days**

http://www.vdh.state.va.us/epi/tickpage.htm

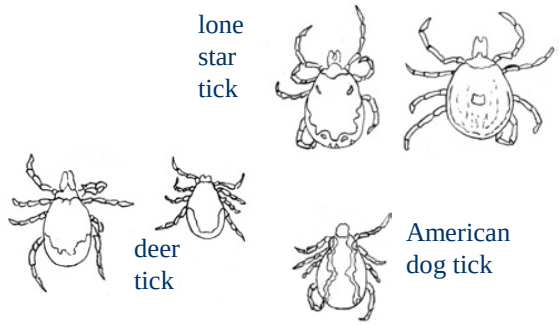


Ticks – Rocky Mountain spotted fever

- **Rocky Mountain spotted fever** is characterized by a sudden onset of symptoms and can be fatal if not treated.
- **In Virginia, the dog tick (*Dermacentor variabilis*)** commonly carries the organism that causes Rocky Mountain spotted fever.
- The tick is usually **attached for 4 to 6 hours** before it transmits the disease.

http://www.vdh.state.va.us/epi/tickpage.htm

Ticks - ehrlichiosis



- **Ehrlichiosis,** is an acute disease of humans and animals caused by bacteria named *Ehrlichia* that attacks white blood cells.
- The bacteria are transmitted to humans by the bite of an infected tick. The ticks that spread ehrlichiosis are the **deer tick, the dog tick and the Lone Star tick.**
- Ehrlichiosis is found in almost any area of the United States and in many foreign countries as well.

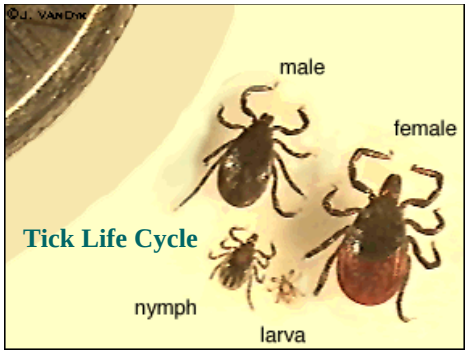
http://www.vdh.state.va.us/epi/tickpage.htm

Alpha-gal Allergy (red meat allergy)

- Alpha-gal allergy is a delayed allergy to mammal meat.
- The allergy is initially caused by the bite of the Lone Star tick.
- The allergic reaction to eating mammal meat is delayed by several hours, the proper diagnosis is often missed or misdiagnosed.
- Allergic reactions can be severe and life-threatening.

Actual size

(L to R) larva, nymph, adult male, adult female, engorged female



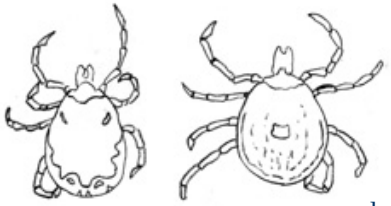
Tick Identification

- All ticks have eight legs in the adult stage, but have six legs as newly hatched larvae.
- The American dog tick, Dermacentor variabilis, is about 5 mm long with short stout mouthparts. It is dark brown with light wavy lines or reticulations on its back.
- The lone star tick, Amblyomma americanum, is about 5 mm in length or less with long mouthparts. It is light reddish-brown with a central white spot on the back of most adults.
- The brown dog tick, Rhipicephalus sanguineus, is about 5 mm long with short, stout mouthparts. It is distinguished from the American dog tick by its dark reddish-brown color and lack of any white markings.
- The deer tick, Ixodes scapularis (formerly Ixodes dammini), is a small tick about 2-3 mm in length with long mouthparts. It is off-white or reddish when fed and has black legs.

http://www.ext.vt.edu

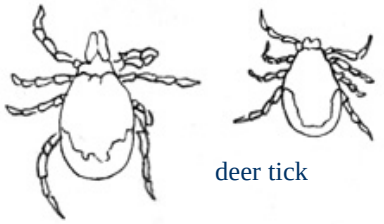
www.afraidtoask.com

American dog tick



lone star tick

Brown dog tick



deer tick

Ticks

- **Prevention**
  - Avoid tick-infested areas such as tall grass and dense vegetation.
  - Walk in the center of mowed trails to avoid brushing against vegetation.
  - Wear light-colored clothing so that ticks are easier to see and remove.
  - Tuck pant legs into socks and boots. Wear long-sleeved shirts buttoned at the wrists.
  - Conduct tick checks on yourself, your children and your pets every 4 to 6 hours.
  - Apply tick repellent to areas of the body and clothing that may come in contact with grass and brush. Select repellents specifically for ticks; ones containing 30 percent DEET or 0.5 percent permethrin are effective in repelling ticks. Follow directions carefully and do not overuse. Some tick repellents can cause toxic or allergic reactions. Permethrin products only work on clothing, not skin.
  - Ask your veterinarian to recommend tick control methods for your pets. Animals can get Lyme disease and Rocky Mountain spotted fever, but they do not transmit these diseases to humans.
  - Keep grass cut and underbrush thinned in yards. Follow directions carefully if chemicals are used for tick control or hire a professional.

http://www.vdh.state.va.us/epi/tickpage.htm

Ticks

- **Tick Removal**
  - Because ticks do not transmit disease until they have been attached to the host for several hours, it is very important to remove ticks as soon as they are found.
  - The best way to remove a tick is to grasp it with tweezers as close to the skin as possible and gently, but firmly, pull it straight out. Avoid any twisting or jerking motion that may break off the mouth parts in the skin. Mouth parts left in the wound will not transmit the disease, but may cause a minor infection, similar to a splinter.
  - If tweezers are not available, protect your fingers with gloves, tissue, or a paper towel. Do not touch the tick with bare fingers. The disease-causing organism can enter the body through a break in the skin on your fingers and cause disease.
  - After the tick has been removed, wash your hands with soap and water. Apply an antiseptic, such as alcohol or iodine, to the bite site.
  - Dispose of the tick by drowning it in alcohol or flushing it down a drain or toilet.
  - Tick removal using nail polish, petroleum jelly, alcohol, or a hot match is not safe.
  - If you get sick and you have been exposed to ticks, be sure to tell your doctor about your tick exposure.

http://www.vdh.state.va.us/epi/tickpage.htm

Rabies



- Rabies is a deadly disease caused by a virus that attacks the nervous system. It kills almost any mammal or human that gets sick from it.
- The rabies virus is mainly in the saliva and brain of rabid animals. It can be transmitted through a bite or by getting saliva or brain tissue in a wound or in the eye or mouth.
- Only mammals get rabies; birds, fish, reptiles, and amphibians do not. Skunks, bats, foxes, raccoons, dogs, cats, and some farm animals are most likely to get rabies. Rabbits, squirrels, rats and mice, and pets like gerbils and hamsters seldom get it.
- Rabies can be prevented in cats, dogs, ferrets, and some livestock with a rabies vaccination. For most wild and exotic animals, there are no rabies vaccines available that have been shown to protect them.
- Because of improved rabies vaccination programs for pets and better treatment for people who are bitten, rabies cases among humans in this country are rare. The best way to prevent the spread of rabies to humans is by keeping pets properly vaccinated.

http://www.vdh.state.va.us/epi/rabiesf.htm

If you have been bitten

- **Don’t panic** . . . but don’t ignore the bite, either. Wash the wound thoroughly with soap and lots of water. Washing thoroughly will greatly lessen the chance of infection. Give first aid as you would for any wound.
- If possible, capture the animal under a large box or can, or at least identify it before it runs away. **Don’t** try to pick the animal up. Call an animal control or law enforcement officer to come get it.
- It's critically important that you notify your family doctor immediately and explain how you got the bite. Your doctor will want to know if the animal has been captured. If necessary, your doctor will give the anti-rabies treatment recommended by the United States Public Health Service. Your doctor will also treat you for other possible infections that could be caused from the bite.
- If it’s a wild animal that must be killed, don’t damage the head. The brain will be needed to test for rabies. Don’t let anyone destroy wild animals at random just because there may be a rabies outbreak in your area. Only a few wild animals will be carrying rabies.

- **Report the bite to the local health department.**

http://www.vdh.state.va.us/epi/rabiesf.htm

Copperhead Snake
(***Agkistrodon contortrix mokasen***)

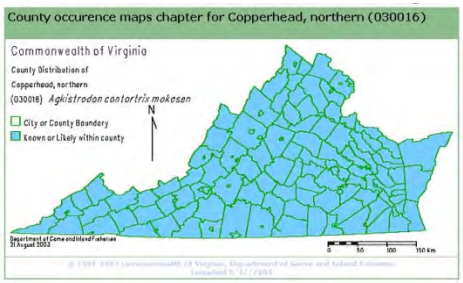
- **Characteristics:**
  - heavy-bodied, medium-sized venomous snake
  - grows to a length of 24-36 in. (61-90 cm).
  - The head is triangular and coppery-red with an hourglass pattern.
  - There are dark, rounded spots on the sides of the belly and the scales are weakly keeled. The upper side of the body and tail are pinkish tan to dark brown, with hourglass-shaped crossbands colored chestnut to dark brown; most dorsal scales are sprinkled with black flecks.

www.dgif.state.va.us

Copperhead Snake

- Juveniles have the same color patterns as the adults, except that the tip of the tail is a sulfur yellow and juveniles lack the black flecking of the adults.
- There are regional differences in body color and pattern throughout Virginia.
- This species mates in April or May and 1-17 young are born from mid-August to early October.
- The copperhead will often hibernate in the company of other snakes.
- It is a sluggish snake that relies on camouflage to escape detection. It may vibrate the tail rapidly when alarmed.

Copperhead Snake



- **Habitat Association** Use a wide variety of habitats, they are found in a range of wetlands, forest types, field settings, and edge areas of all types; found to use open areas with higher rock densities; use all types of structures for cover, including abandoned buildings, brush piles, stone walls, etc.; require areas of sunlight, good populations of prey, and year-round shelter, which is often found around human habitations.

Source: www.dgif.state.va.us

- **Foods:** The prey eaten depends on the size of the snake, with juveniles taking more invertebrates and adults eating more small mammals such as rodents. Mice are the primary prey, but they also take lizards, small snakes, amphibians, small birds, and insects.

- **Status Comments:** Nongame-Protected; Found state wide, except on the barrier islands; appear to be more abundant in mountains than in the Piedmont and Coastal Plain

www.dgif.state.va.us

- **If you see a copperhead snake it is best to turn around and walk away from it.**

Mitchell, J. C., 1994, The Reptiles of Virginia, 352 pgs., Smithsonian Institution Press, Washington, DC

Spiders

Southern Black Spider – Jeff Hahn, University of Minnesota, Cooperative Extension

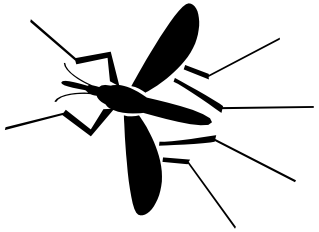
The danger of spider bites: Most spiders found in the United States are harmless, with the exception of the black widow and the brown recluse spiders (sometimes called the violin spider). Both of these spiders are found in warm climates.

Black Widow Spider (Latrodectus hesperus)

- A black widow spider is a small, shiny, black, button-shaped spider with a red hourglass mark on its abdomen, and prefers warm climates. Black widow spider bites release a toxin that can cause damage to the nervous system, thus emergency medical treatment is necessary.
- **Habitat:** Widow spiders generally do not infest homes but prefer dark, close quarters outdoors such as woodpiles or crevices under rocks. Indoors they are found in quiet locations such as basements, crawl spaces, and attics typically nesting in narrow gaps between the wall and a stored box or other object. The habit of building their webs between stationary objects and the wall of a structure sometimes allows widow spiders to become a significant pest of warehouses and similar storage facilities.

http://www.healthsystem.virginia.edu/uvahealth/adult_nontrauma/spider.cfm

West Nile Virus



- **What is it?**
  West Nile virus (WNV) is a potentially serious illness effecting the central nervous system. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall.

- **How Does West Nile Virus Spread?**
  - **Infected Mosquitoes.** Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes are WNV carriers that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.
  - **Transfusions, Transplants, and Mother-to-Child. Not through touching.**

- **What Can I Do to Prevent WNV?**
  The easiest and best way to avoid WNV is to prevent mosquito bites.
  - When you are outdoors, use insect repellents containing DEET (N, N-diethyl-meta-toluamide). Follow the directions on the package.
  - Many mosquitoes are most active at dusk and dawn. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours. Light-colored clothing can help you see mosquitoes that land on you.
  - Make sure you have good screens on your windows and doors to keep mosquitoes out.
  - Get rid of mosquito breeding sites by emptying standing water from flower pots, buckets and barrels. Change the water in pet dishes and replace the water in bird baths weekly. Drill holes in tire swings so water drains out. Keep children's wading pools empty and on their sides when they aren't being used.

www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm

Zika Virus

- Installation authorities are continuing concerted efforts to reduce the threat of the Zika Virus to Fort Belvoir residents. This includes on-going surveys and monitoring of high risk areas, treatment of mosquito breeding sites with larvicides, and reducing potential breeding pools. Mosquitoes are trapped and collected from several locations on the installation. Public Health personnel sort the mosquitoes by species and sex. There have been 4 confirmed cases of Human Zika Virus found in the State of Virginia to date with the most recent in March 2016. These cases were all from travelers who traveled outside the Continental United States.
- Fort Belvoir will continue with a comprehensive, cooperative program to reduce the risk of Zika Virus. The main objectives are to keep residents informed of current actions and precautions that should be taken and to continue implementing best IPM practices to control mosquito populations and to enhance the safety of Fort Belvoir's residents and employees.
- Some mosquito breeding may take place on the installation in artificial containers and small temporary pools of water. Most of the mosquitoes that bite installation personnel come from these sources.
- Adult mosquitoes rarely require fogging for control. When required, residual insecticides are applied to vegetative mosquito resting areas. Coordination for mosquito control on lakes and ponds is between Garrison leadership, DPW, Housing personnel and Health Authorities.
- Currently, there is neither a vaccine nor medication available to prevent Zika virus infection. If you plan to travel to an area where the Zika virus is ongoing it is crucial to protect yourself from mosquito bites:
- Cover exposed skin by wearing long-sleeved shirts and long pants.
- Use EPA-registered insect repellents Always use as directed.
- Use permethrin-treated clothing and gear (such as boots, pants, socks, and tents). You can buy pre-treated clothing and gear or treat them yourself.
- Stay and sleep in screened-in or air-conditioned rooms.

Sources

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Appendix N

Memorandum of Agreement for Cooperative Law Enforcement between the U.S. Fish and Wildlife Service and Fort Belvoir, Virginia

MEMORANDUM OF AGREEMENT
For Cooperative Law Enforcement
between the
U.S. Fish and Wildlife Service
and
Fort Belvoir, Virginia

This Memorandum of Agreement is a cooperative agreement entered into under authority of Fish and Wildlife Revenue Enhancement Act of 1998, 16 U.S.C. Section 742*l*(b) between the U.S. Fish and Wildlife Service, hereinafter "Service" or "Chief, Office of Law Enforcement" and the Fort Belvoir, Virginia, hereinafter "the Installation."

Whereas, the Congress of the United States and the Installation have found that the protection and conservation of fish, wildlife, and other natural resources is in the best interest of the public and have enacted various laws to provide for the protection and conservation of wildlife and native plants.

Whereas, the United States Congress has given the Secretary of the Interior the authority to enforce certain laws dealing with the protection and conservation of fish, wildlife, and other natural resources and this authority has been delegated to the Director of the Service and to certain qualified individuals.

Whereas, the Service and the Installation recognize that mutual benefits will accrue to the law enforcement efforts of each by entering into a Memorandum of Agreement to share law enforcement expertise, training, intelligence information, specialized equipment, funding, and facilities, and to designate law enforcement officers to efficiently enforce all laws administered by the Service and the Installation relating to fish, wildlife, and other natural resources.

Whereas, the Service has determined that it is necessary and appropriate to utilize certain officers, services, and facilities of the Installation to assist in providing effective enforcement of Federal laws on the lands and waters within the jurisdiction of the Installation.

Whereas, the Installation has determined that it is necessary and appropriate to utilize certain officers, services, and facilities of the Service to assist in providing effective enforcement of Federal laws on the lands and waters within the jurisdiction of the Installation.

Therefore, the parties agree that:

A. Delegation of Federal Authority

(1) The Chief, Office of Law Enforcement, hereby delegates to the Installation the authority to enforce the following Federal laws dealing with the protection and conservation of fish, wildlife, and natural resources of the United States and regulations that are issued pursuant thereto and are within the limitations of and subject to the jurisdiction of the laws of the United States, and occurring within the jurisdiction of the laws of the State of Virginia.

Airborne Hunting Act (16 U.S.C. 742j-1)

Archeological Resources Protection Act (16 U.S.C. 470aa-11)

Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)

Endangered Species Act of 1973 (16 U.S.C. 1531-1544)

Lacey Act and Lacey Act Amendments of 1981 (18 U.S.C. 42, 16 U.S.C. 3371-3378)

Marine Mammal Protection Act (16 U.S.C. 1361-1384, 1401-1407)

Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. 718-718k)

Migratory Bird Treaty Act (16 U.S.C. 703-712)

National Wildlife Refuge System Administration Act (16 U.S.C. 668dd-668ee)

This Agreement does not delegate authority to enforce the import and/or export provisions of the statutes above unless the designee is accompanied by or under the direct supervision of a Service special agent or wildlife inspector.

(2) The Chief, Office of Law Enforcement specifically delegates to the Installation the same authority to search, seize, arrest, and exercise other law enforcement functions under the laws specified in paragraph A(1) of this Agreement as if the Installation were employed by the Department of the Interior and authorized by the Secretary of the Interior to enforce those laws.

(3) This Agreement between the Service and the Installation may not be used to delegate Federal law enforcement authority to any person convicted of a misdemeanor crime of domestic violence or otherwise prohibited from possessing firearms, within the meaning of 18 U.S.C. § 922(g).

B. Re-delegation of Federal Authority

(1) The Installation may designate individuals to exercise the authority to enforce the conservation laws and regulations of the United States as specified above. This designation may only be to a person who meets all the following criteria:

(a) The officer is employed as a full-time law enforcement officer of the Installation

(i) whose principal law enforcement duty is the enforcement of conservation laws or native plant protection,

(ii) and who has successfully completed all the required Installation law enforcement training to meet full certification as a Installation conservation law enforcement officer,

(iii) and has successfully completed a probationary period (minimum of 1 year).

(b) The officer must be proficient in the use of firearms and other weapons as demonstrated by meeting the firearms qualification, re-qualification, and other training standards required by the Installation. The officer will only utilize the firearms and weapons he or she is authorized to carry and use according to the firearms and weapons policies of Installation.

(c) The officer agrees to follow the Service's Use of Force policy when acting under this Agreement. The Service recognizes that the officer may be authorized to carry and use a chemical spray and/or impact weapon that differs from the weapons authorized by the Service. In these situations, the officer can continue to carry and use the chemical spray and/or impact weapon that is authorized by the Installation, but the officer must adhere to the levels of control/force for the use of these weapons as outlined in the Service's Use of Force policy. The Service's Use of Force policy is attached and will be transmitted to all officers so delegated under this Agreement.

(2) The Installation shall notify the Service of the full name, address and date of birth of each designee. This designation shall become effective upon the filing of such information with the Service; such delegation of authority shall not constitute a commission or office within the meaning of the laws of the Installation. The chief law enforcement official for the Installation shall issue a Service identification card (Form 3-522a) to each designee, along with a copy of this Agreement and the Service Use of Force and Firearms policies.

(a) If at any time, any person designated to exercise authority under this Agreement fails to meet any of the criteria set forth in paragraph B, the Installation shall not approve or shall immediately terminate the designation when the Installation becomes aware of such failure and shall immediately notify the Service.

(b) Information about the addition or deletion of designated officers should be provided to the Service within 30 days. The Installation will provide a complete up-to-date list of officers holding authority under this Agreement to the Service by January 15 of each year.

(3) Officers of the Installation who have been delegated authority under this Agreement may only exercise such authority within the normal jurisdiction of the Installation, except as provided for in 3(a), (b), and (c) below.

(a) An officer of the Installation may exercise such authority anywhere within the jurisdiction of the United States when accompanied by a Service special agent or when under the direct supervision of a Service special agent.

(b) Officers of the Installation may exercise such authority outside of their normal jurisdictions when exigent circumstances so require and such actions will be immediately reported to a Service special agent.

(c) This agreement does not include authority to enforce conservation laws and regulations of the United States on Federal tribal lands unless such authority is already conferred by an

existing law or agreement. However, an officer of the Installation may exercise such authority on tribal lands, when accompanied by and under the direct supervision of a Service special agent.

(4) An employee of the Installation who has been delegated authority under this Agreement must comply with Public Law 103-272, 49 U.S.C. 46505(b) and the pertinent regulations (49 CFR 1544.219) regarding carrying firearms on commercial aircraft. Prior to carrying a firearm on a commercial aircraft, officers of the Installation must obtain specific written authorization from the chief law enforcement officer of the Installation as well as follow the requirements of the regulations issued by the United States Department of Homeland Security.

The law specifically states that this prohibition does not apply to law enforcement officers of the Federal government who are authorized or required to carry firearms in their official capacity.

(5) The Service may, by written notice to the Installation, terminate any designation made by the Installation.

(6) The Installation and officers to whom the Service has designated authority under this Agreement shall, while acting under this Agreement, agree that:

(a) The designees are not to be deemed Federal employees by virtue of their designation and shall not be subject to Federal law relating to hours of work, competitive examination, rates of compensation, and Federal employee benefits, except those individuals who already qualify as Federal employees under their current position.

(b) The Installation shall continue to provide compensation under the current Installation coverage for work-related injuries while the designees are acting under this Agreement. Designated individuals may be considered eligible for compensation under subchapter III of chapter 81 of Title 5, if activities are initiated and approved by the Service.

(c) While performing duties under this Agreement, the designees shall be considered investigative or law enforcement officers of the United States for the purposes of the tort claim provisions of 28 U.S.C. and 5 U.S.C. 8401(17).

(d) While performing duties under this Agreement, the designees shall be considered officers or employees of the Department of the Interior within the meaning of 18 U.S.C. sections 111 and 1114.

(7) The Installation must recall and cancel any designation of authority upon termination of employment or reassignment of the officer concerned to non-law enforcement duties or upon notice that the person no longer meets all of the criteria for issuance of such authority. Notice of such recall or cancellation shall immediately be given to the Service.

D. Coordination

The Special Agent in Charge, Office of Law Enforcement, in Hadley, Massachusetts, or his designee and the chief wildlife law enforcement officer of the Installation shall confer within 45 days after the signing of this Agreement, and as necessary, for the purpose of:

(1) identifying enforcement problems in areas of concurrent jurisdiction that may require joint enforcement operations or investigations;

(2) identifying enforcement problems that may require covert investigation;

(3) identifying the need for specialized law enforcement equipment;

(4) discussing new techniques and methods for the detection and apprehension of violators of conservation laws and the exchange of law enforcement information in general; and

(5) reviewing training programs and identifying the need for additional instruction in the Installation and/or Federal laws, policies, interpretations, or other appropriate subjects.

E. Cooperative Agreements

The Service and the Installation may enter into an investigation specific cooperative agreement detailing operational aspects and the sharing of resources between the parties, including, but not limited to: funding personnel, equipment, intelligence, investigative reports, prosecution of cases, media releases, handling and care of evidence, and disposition of assets.

F. Actions to be taken by the Parties

(1) The Service will provide to the Installation, subject to available resources and manpower, copies of Federal laws and regulations and pertinent Service policy and interpretations and the assistance of special agents and the use of equipment for specific, high-priority enforcement operations.

(2) The Service and the Installation will jointly confer with designees to ensure they understand the elements of this Agreement and responsibilities of accepting conferral of authority to enforce Federal laws and regulations.

(3) The Installation will provide the Service, subject to available resources and manpower, copies of State laws and regulations and pertinent policies and interpretations and the assistance of Installation officers and the use of equipment for specific, high-priority enforcement operations.

(4) The Installation will make officers available, upon request by the appropriate Federal authority, to appear as witnesses in connection with any action brought with which they have an involvement.

(5) The Service may reimburse Installation officers who appear in Federal court for cases related to this Agreement for travel expenses and per diem at rates authorized by the Federal Travel Regulations for travel incurred while providing direct services to the Federal government as a witness, or for other related activities, in accordance with applicable Federal law.

G. Amendment, Effective Date and Termination

(1) This Amendment shall become effective on the date signed by both parties and filed with the Installation and shall continue in effect until terminated.

(2) The Agreement may only be revised or amended by consent of both parties. Such revisions or amendments shall not be effective until reduced to writing and signed by both parties.

(3) This Agreement may be terminated by either party upon giving thirty (30) days advance written notice.

H. Contacts and Designee

For the purpose of this Agreement, contact or coordination with the Service means contact or coordination with the Special Agent in Charge, Northeast Region, at 413-253-8340.

I. Third Party Claims

Nothing in this Agreement is intended to create any right, privilege, or benefit not otherwise recognized by law for persons, organizations, or entities not party to this Agreement.

K Adams

Chief, Office of Law Enforcement
U.S. Fish and Wildlife Service

Date: 8-21-06

Garrison Commander
Fort Belvoir, Virginia

Date: 24 July 06

Richard O. Bennett, Ph.D.

Acting

Regional Director
U.S. Fish and Wildlife Service

Date: 8-15-06

Date: _____

Attachments:
U.S. Fish and Wildlife Service Firearms Policy
U.S. Fish and Wildlife Service Use of Force Policy
U.S. Fish and Wildlife Service Office of Law Enforcement Contact Information

Appendix O

Severe Weather Vulnerability Operations Order

Fort Belvoir

OPERATIONS ORDER 15-095

Vulnerability of IMCOM Installations to Severe Weather and Projected Changes in Climate

PURPOSE

- Meeting with Garrison Commander & Key Stakeholder
- Discuss Survey impacts from:
  - Severe Weather
  - Rise of Sea Level
- Identify Installation Sustainability Coordinator

BACKGROUND

- OSD Initiative
  - Web based survey system
  - 30 year look back
- Eight Topics
  - Storm Surge
  - Flooding
  - Wind
  - Drought
  - Wildfire
  - Extreme Hot or Cold
  - Increased Sea Level (3ft, 6ft, 9ft, 12ft)
  - 100yr and 500yr floodplain
- Looked at all six sites - impacts identified only at Fort Belvoir main post

ASSESSMENT (Storm Surge)

- Events
  - Storm events in 1996, 1999, 2003, 2006, 2011, and 2012.
  - Hurricane Isabel (2003) – Highest inundation level was at 10ft.
- Response
  - Short-Term: Closed access to affected areas to allow for natural drainage
  - Long-Term: Belvoir DPW considers flood hazard risks with regards to land use planning.

ON-SITE IMPACTS	OFF-SITE IMPACTS
Airfield Operations	Airport
Training Areas/Ranges/Facilities	
Piers/Waterfront Services	Piers/Waterfront Services
Information Systems	Information Systems
C4ISR	
Energy Infrastructure	Energy Infrastructure
Fuel Infrastructure	Fuel Infrastructure
Logistics Supply	Logistics Supply
Transportation Infrastructure/Routes	Transportation Infrastructure/Routes
Emergency Services	Emergency Services
Water/Wastewater Systems	Water/Wastewater Systems
HVAC Systems	HVAC Systems
Environmental Restoration Sites	
Natural Resources	
Historic/Cultural Resources	
Housing	Housing
HQ Buildings	
Personnel Support	

ASSESSMENT (Flooding)

- Events
  - Storm events in 1995, 1996, 1999, 2006, 2007, 2008, 2009, 2010, 2011, and 2012.
  - A flood event during September 2011 produced 7in of rain in a 3hr period. Vehicles were flooded on US Route 1, parking garages became flooded, roads with steep grades were undermined due to erosion.
- Response
  - Short-Term: Belvoir responded to this degradation by focusing on life, health, safety, and mission critical requests.
  - Long-Term: Widening of US Route 1 raises the roadway and bridges to prevent flooding.

ON-SITE IMPACTS	OFF-SITE IMPACTS
Airfield Operations	Airport
Training Areas/Ranges/Facilities	
Piers/Waterfront Services	Piers/Waterfront Services
Information Systems	Information Systems
C4ISR	
Energy Infrastructure	Energy Infrastructure
Fuel Infrastructure	Fuel Infrastructure
Logistics Supply	Logistics Supply
Transportation Infrastructure/Routes	Transportation Infrastructure/Routes
Emergency Services	Emergency Services
Water/Wastewater Systems	Water/Wastewater Systems
HVAC Systems	HVAC Systems
Environmental Restoration Sites	
Natural Resources	
Historic/Cultural Resources	
Housing	Housing
HQ Buildings	
Personnel Support	

ASSESSMENT (Wind)

- Events
  - Wind events during 1996, 1998, 2000, 2001, 2003, 2007, and 2012.
  - The Derecho (June 2012) produced winds in excess of 70mph that damaged or blew down a number of trees and utility poles and resulted in the loss of electrical power, communication lines, and internet connectivity over a large portion of the installation.
- Response
  - Short-Term: Belvoir responded by working with our privatized electric and communication suppliers in order to fix power poles and broken lines, restore power, and communications.
  - Long-Term: Belvoir is converting overhead power and communication lines to underground lines.

ON-SITE IMPACTS	OFF-SITE IMPACTS
Airfield Operations	Airport
Training Areas/Ranges/Facilities	
Piers/Waterfront Services	Piers/Waterfront Services
Information Systems	Information Systems
C4ISR	
Energy Infrastructure	Energy Infrastructure
Fuel Infrastructure	Fuel Infrastructure
Logistics Supply	Logistics Supply
Transportation Infrastructure/Routes	Transportation Infrastructure/Routes
Emergency Services	Emergency Services
Water/Wastewater Systems	Water/Wastewater Systems
HVAC Systems	HVAC Systems
Environmental Restoration Sites	
Natural Resources	
Historic/Cultural Resources	
Housing	Housing
HQ Buildings	
Personnel Support	

ASSESSMENT

- Drought: No Impacts
- Wildfire: No Impacts
- Extreme Hot and Cold: No Impacts

ASSESSMENT (Sea Level Rise: 3ft)

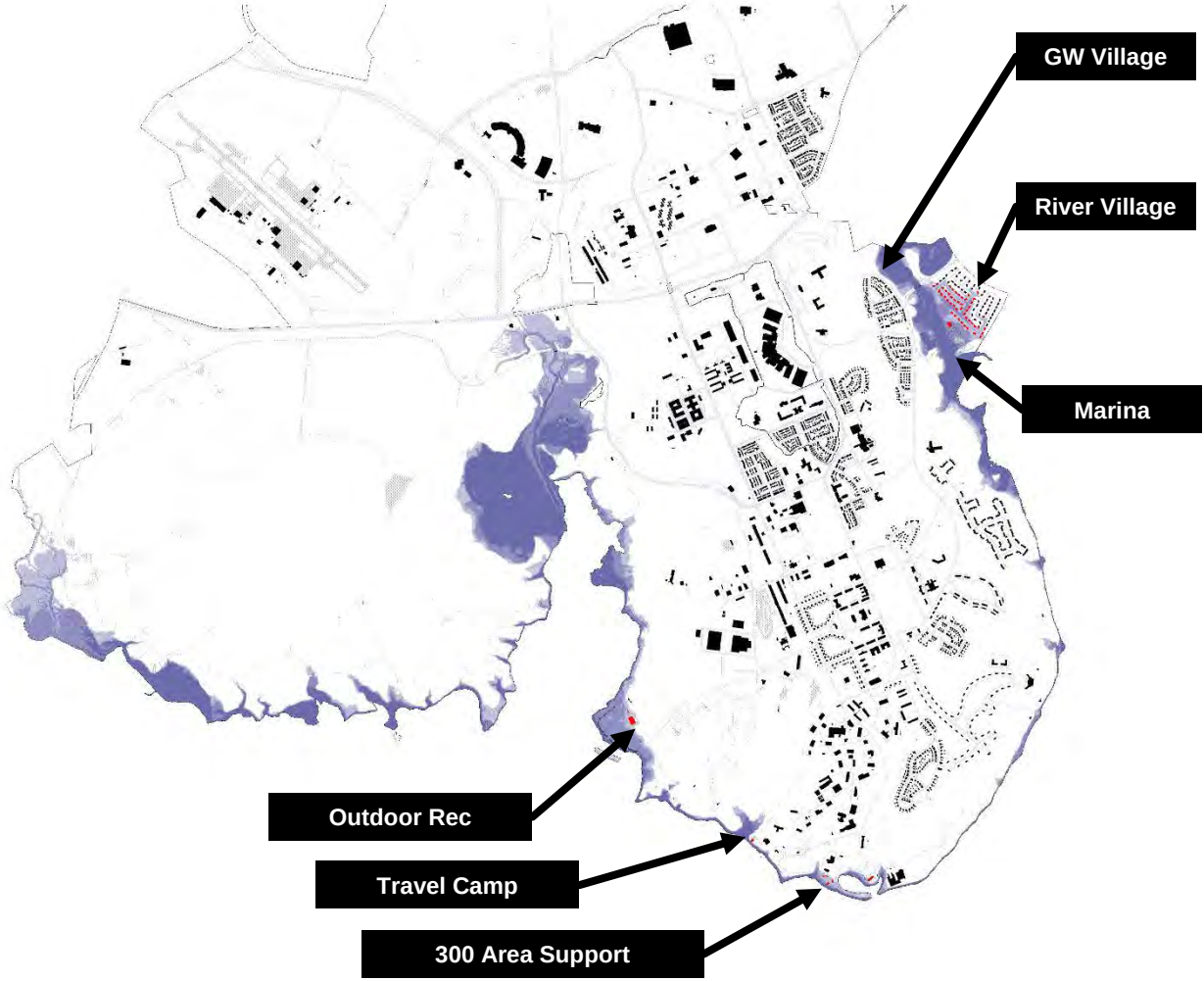
- 236 Acres
- 3% of Installation
- Impacts
  - On-Site: Piers and Waterfront Services, Natural Resources, and Historic and Cultural Resources.
  - Off-Site: Piers and Waterfront Services.
  - Marina affected.

ASSESSMENT (Sea Level Rise: 6ft)

- 381 Acres
- 5% of Installation
- Impacts
  - On-Site: Piers and Waterfront Services, Transportation Infrastructure and Routes, Natural Resources, Historic and Cultural Resources, and Housing.
  - Off-Site: Piers and Waterfront Services, Transportation Infrastructure and Routes, and Housing.
  - 10 Buildings affected.

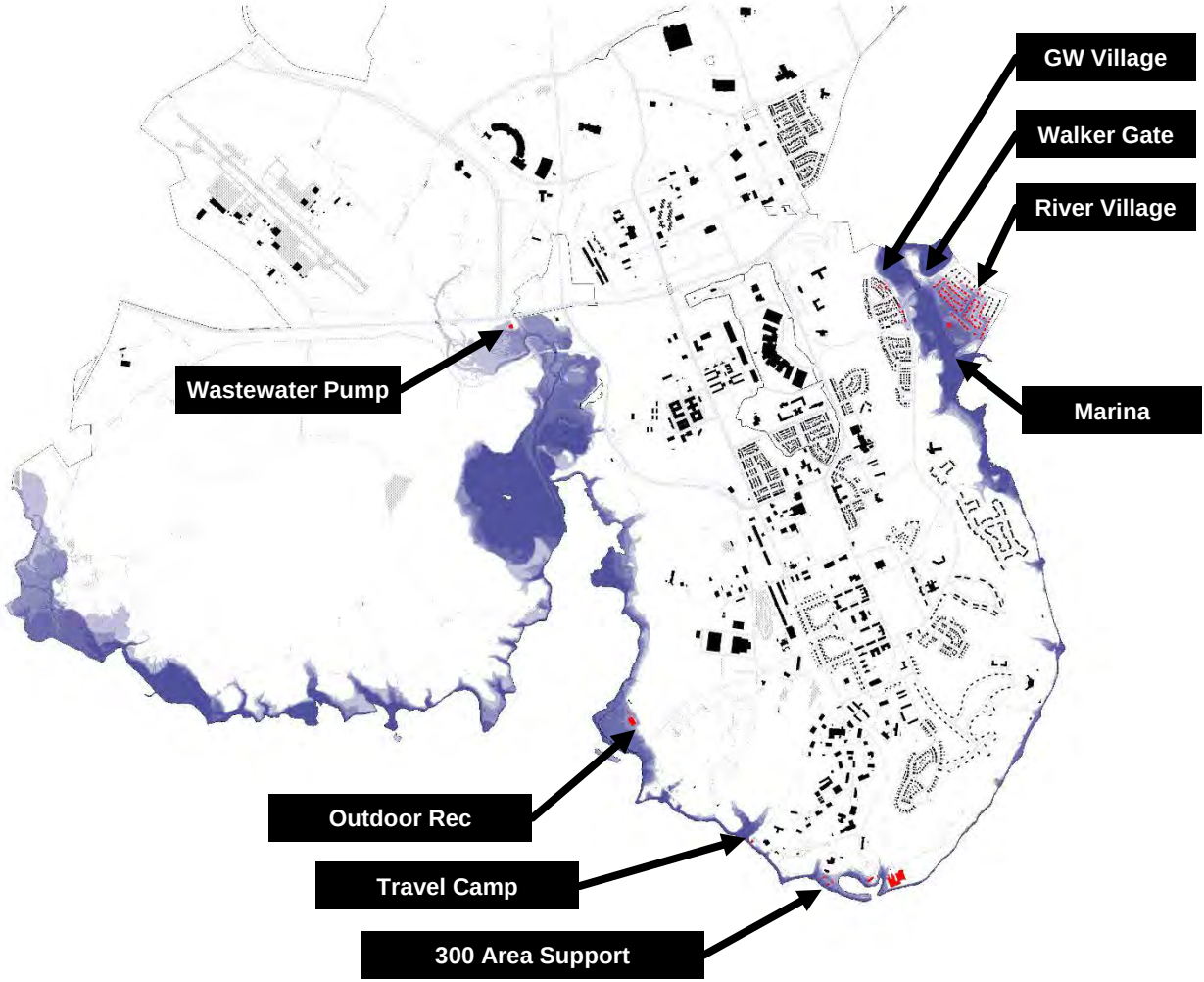
ASSESSMENT (Sea Level Rise: 9ft)

- 516 Acres
- 6% of Installation
- Impacts
  - On-Site: Piers and Waterfront Services, Transportation Infrastructure and Routes, Natural Resources, Historic and Cultural Resources, and Housing.
  - Off-Site: Piers and Waterfront Services, Transportation Infrastructure and Routes, and Housing.
  - 58 Buildings affected.



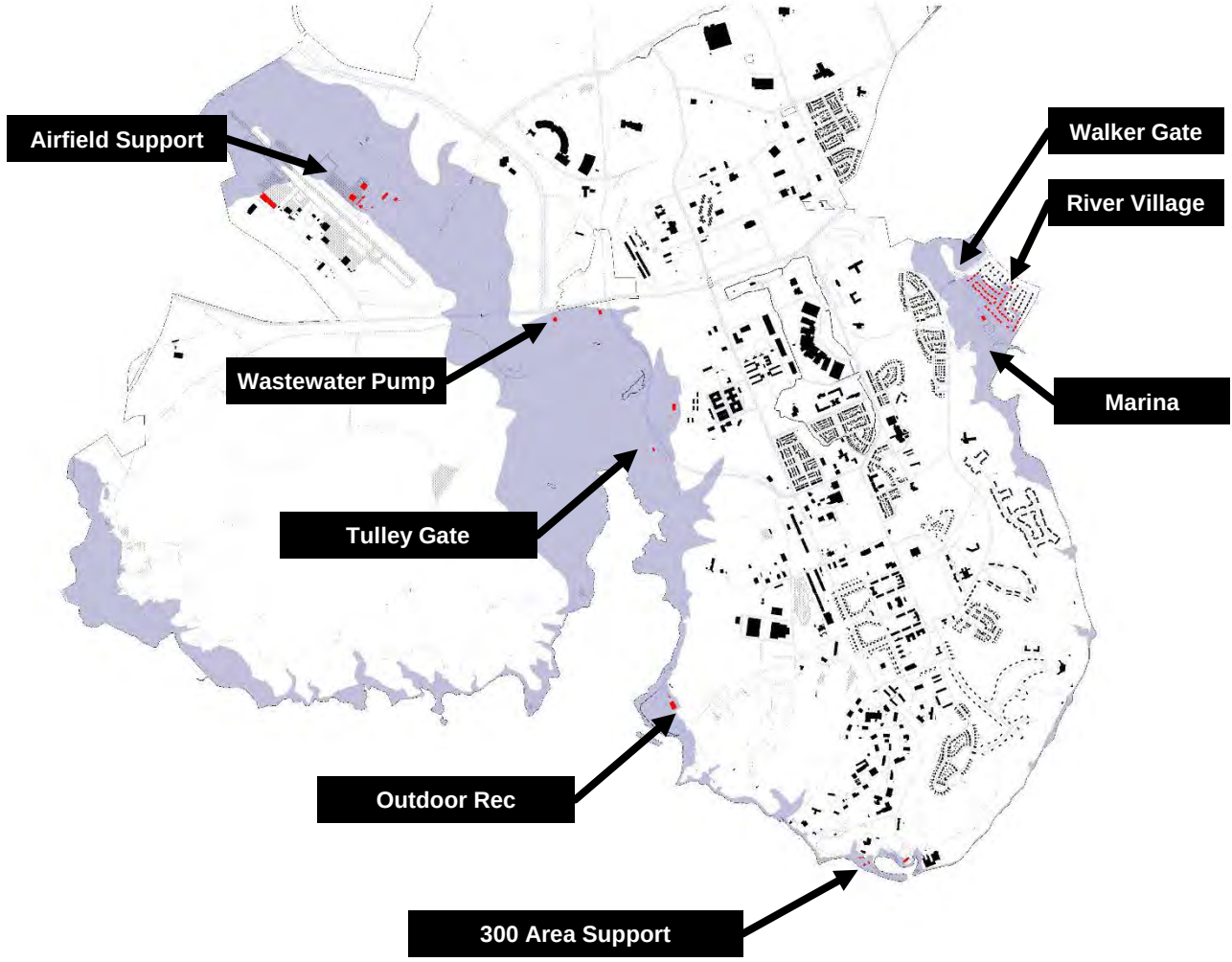
ASSESSMENT (Sea Level Rise: 12ft)

- 667 Acres
- 8% of Installation
- Impacts
  - On-Site: Piers and Waterfront Services, Transportation Infrastructure and Routes, Natural Resources, Historic and Cultural Resources, and Housing.
  - Off-Site: Piers and Waterfront Services, Transportation Infrastructure and Routes, and Housing.
  - 102 Buildings Affected



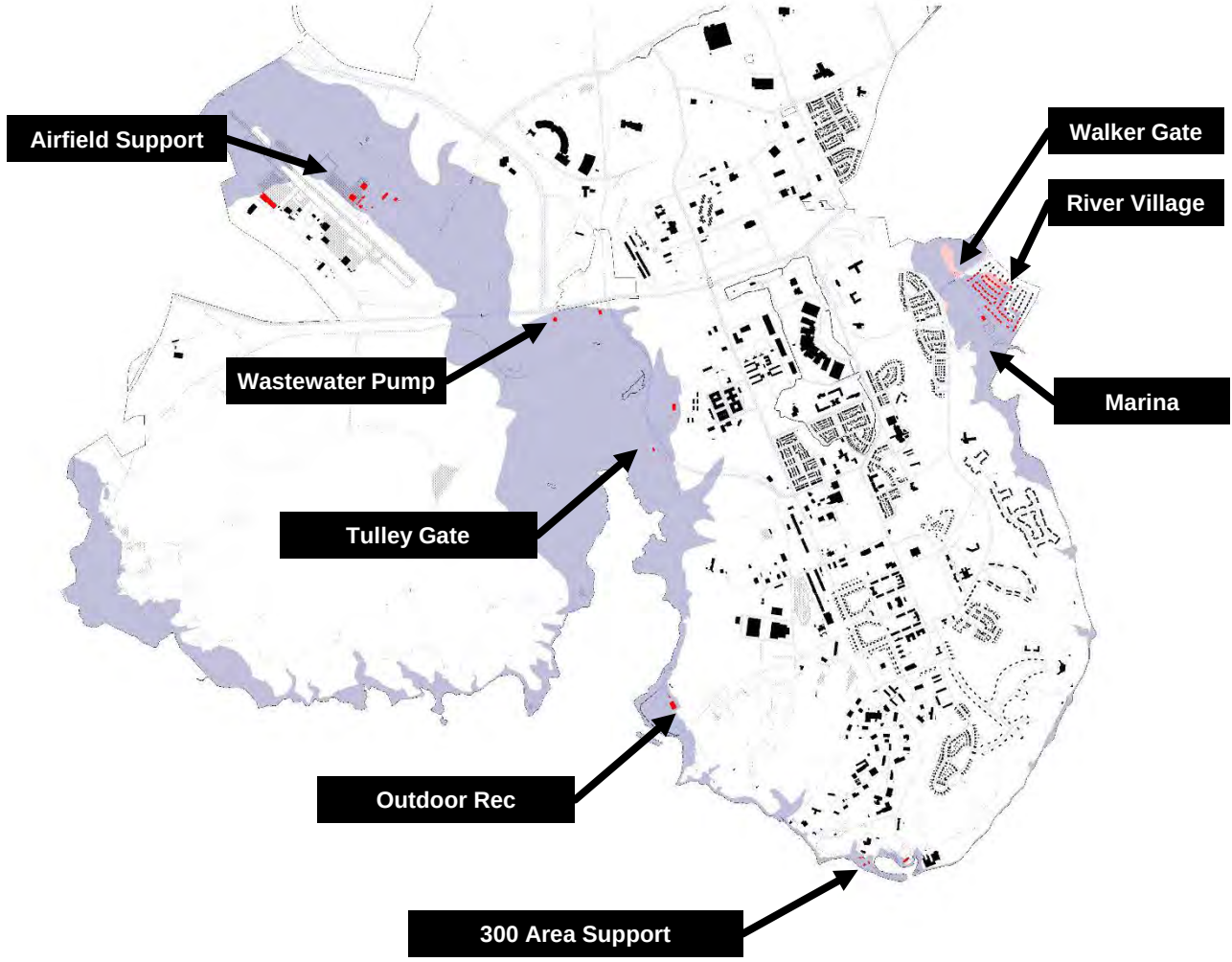
ASSESSMENT (100 Year, 1% Chance Flood)

- 1244 Acres
- 16.1% of Installation
- Impacts
  - 93 Buildings fall within these areas:
    - 53 – Residential
    - 6 – Professional/Institutional
    - 1 – Industrial
    - 14 – Community
    - 19 – Airfields
- Accotink Creek requires Hydraulic and Hydrologic study.
- Possible FEMA support (Letter of Map Amendment)



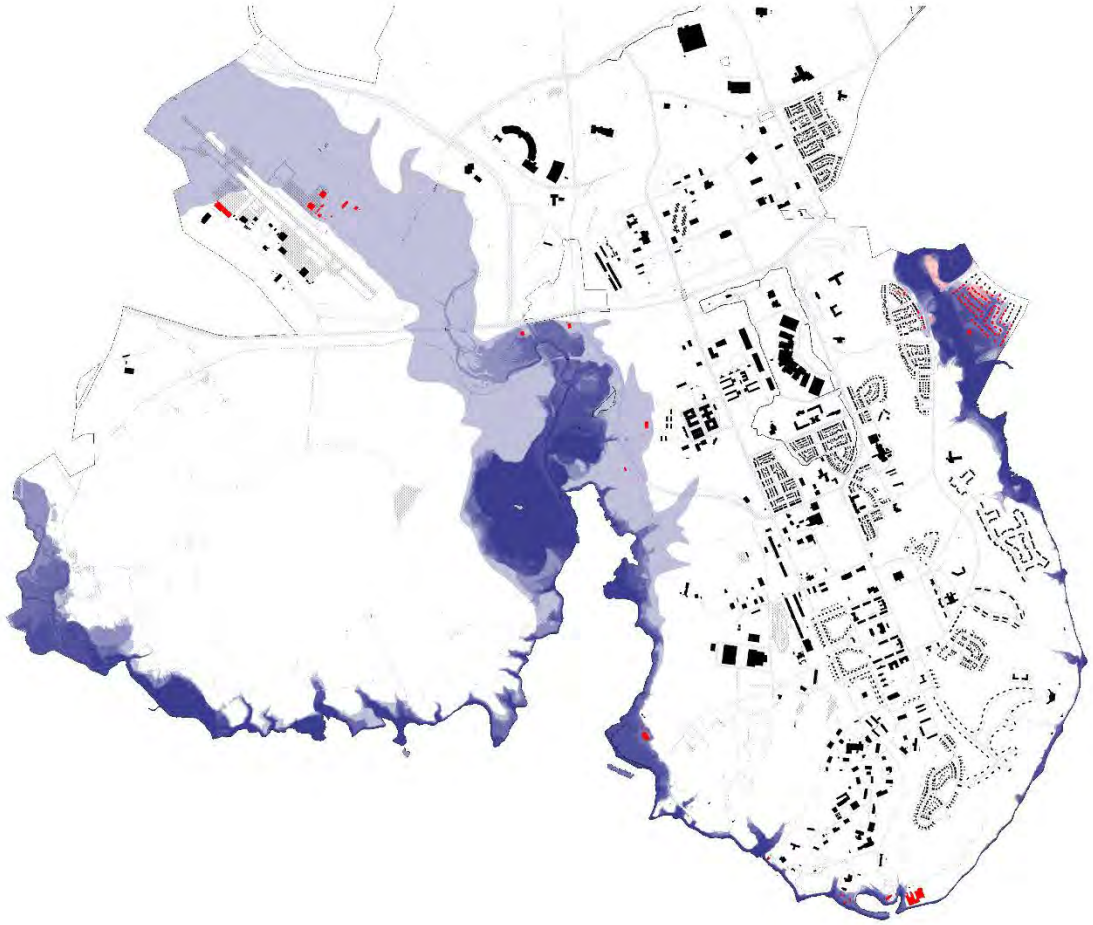
ASSESSMENT (500 Year, 0.2% Chance Flood)

- 1267 Acres
- 16.4% of Installation
- Impacts
  - 103 Buildings fall within these areas
    - 63 – Residential
    - 6 – Professional/Institutional
    - 1 – Industrial
    - 14 – Community
    - 19 – Airfields
- Accotink Creek requires Hydraulic and Hydrologic study.
- Possible FEMA support (Letter of Map Amendment)



WAY AHEAD

- Impacts
  - Walker and Tulley Gates
  - River and George Washington Village
  - Davison Army Airfield
  - Pier and buildings in 300 Area
- Potential Facilities Investment Strategy
  - Development of Woodlawn East (Berman Tract)
  - In-fill housing within existing Woodlawn Village footprint, town center, and old commissary area
  - Raising and Waterproofing select manholes
  - Relocation of pump station at 6ft rise
  - Improve drainage at Davison Army Airfield
  - Building 698 – Planning to reroute the lateral to Building 685 at RV camp
  - Reconstruction of pier to support 300 area if necessary
  - Dialog with Fairfax County to relocate pump station
- Due Outs: Meeting Minutes to IMCOM



QUESTIONS?

Backup Slides

ASSESSMENT (Sea Level Rise: 3ft, Tabular)

Marina Flooded.

ASSESSMENT (Sea Level Rise: 6ft, Tabular)

BUILDING	NAME	ADDRESS
338	BOAT MAINTENANCE FACILITY	5945 WILSON ROAD
698	SEWAGE PUMPING STATION	10280 KNIGHT ROAD
1605	FAMILY HOUSING	5442/5440 HUDSON ROAD
1606	FAMILY HOUSING	5438/5436 HUDSON ROAD
1607	FAMILY HOUSING	5434/5432 HUDSON ROAD
1608	FAMILY HOUSING	5430/5428 HUDSON ROAD
1650	FAMILY HOUSING	9123/9125 SHENANDOAH ROAD
1651	FAMILY HOUSING	5420/5418 HUDSON ROAD
1695	SEWAGE PUMPING STATION	5457 HUDSON ROAD
1696	BOAT HOUSE, REPAIR SHOP	5465 HUDSON ROAD

ASSESSMENT (Sea Level Rise: 9ft, Tabular)

BUILDING	NAME	ADDRESS
337	ADMIN, GEN PURP	5895 WILSON ROAD
338	BOAT MAINTENANCE FACILITY	5945 WILSON ROAD
339	464TH BOAT COMPANY TRAILER	5945 WILSON ROAD
349	STOREHOUSE, GEN PURP	6001 WILSON ROAD
698	SEWAGE PUMPING STATION	10280 KNIGHT ROAD
778	MWR OUTDOOR RECREATION	10155 JOHNSTON ROAD
1601	FAMILY HOUSING	5454 HUDSON/9120 DELAWARE ROADS
1602	FAMILY HOUSING	9119 DELAWARE/5452 HUDSON ROADS
1603	FAMILY HOUSING	5450/5448 HUDSON ROAD
1604	FAMILY HOUSING	5446/5444 HUDSON ROAD
1605	FAMILY HOUSING	5442/5440 HUDSON ROAD
1606	FAMILY HOUSING	5438/5436 HUDSON ROAD
1607	FAMILY HOUSING	5434/5432 HUDSON ROAD
1608	FAMILY HOUSING	5430/5428 HUDSON ROAD
1609	FAMILY HOUSING	9124/9122 SHENANDOAH ROAD
1610	FAMILY HOUSING	5501/5503 JAMES ROAD
1611	FAMILY HOUSING	5505/5507 JAMES ROAD
1612	FAMILY HOUSING	5509/5511 JAMES ROAD
1613	FAMILY HOUSING	5515/5517 JAMES ROAD
1614	FAMILY HOUSING	5519/5521 JAMES ROAD
1615	FAMILY HOUSING	5523/5525 JAMES ROAD
1616	FAMILY HOUSING	5527 JAMES/9115 DELAWARE ROADS
1617	FAMILY HOUSING	9118/9116 DELAWARE ROAD
1621	FAMILY HOUSING	5524/5522 JAMES ROAD
1622	FAMILY HOUSING	5520/5518 JAMES ROAD
1623	FAMILY HOUSING	5516/5514 JAMES ROAD
1624	FAMILY HOUSING	5512/5510 JAMES ROAD
1625	FAMILY HOUSING	5508/5506 JAMES ROAD
1626	FAMILY HOUSING	5500 JAMES/9110 SHENANDOAH ROADS

BUILDING	NAME	ADDRESS
1627	FAMILY HOUSING	9106 SHENANDOAH/5405 YORK ROADS
1645	FAMILY HOUSING	9105 SHENANDOAH/5402 YORK ROADS
1646	FAMILY HOUSING	5403 YORK/9107 SHENANDOAH ROADS
1647	FAMILY HOUSING	9109/9111 SHENANDOAH ROAD
1648	FAMILY HOUSING	9115/9117 SHENANDOAH ROAD
1649	FAMILY HOUSING	9119/9121 SHENANDOAH ROAD
1650	FAMILY HOUSING	9123/9125 SHENANDOAH ROAD
1651	FAMILY HOUSING	5420/5418 HUDSON ROAD
1652	FAMILY HOUSING	5416/5414 HUDSON ROAD
1653	FAMILY HOUSING	5412/5410 HUDSON ROAD
1654	FAMILY HOUSING	5408/5406 HUDSON ROAD
1655	FAMILY HOUSING	9208/9206 POTOMAC LOOP
1670	FAMILY HOUSING	9220/9222 POTOMAC LOOP
1684	FAMILY HOUSING	9211/9209 POTOMAC LOOP
1685	FAMILY HOUSING	9207/9205 POTOMAC LOOP
1686	FAMILY HOUSING	9203/9201 POTOMAC LOOP
1687	FAMILY HOUSING	5401/5403 HUDSON ROAD
1689	FAMILY HOUSING	5409/5411 HUDSON ROAD
1690	FAMILY HOUSING	5413/5415 HUDSON ROAD
1691	FAMILY HOUSING	5417/5419 HUDSON ROAD
1692	FAMILY HOUSING	5421/5423 HUDSON ROAD
1693	FAMILY HOUSING	5425/5427 HUDSON ROAD
1694	FAMILY HOUSING	5429/5431 HUDSON ROAD
1695	SEWAGE PUMPING STATION	5457 HUDSON ROAD
1696	BOAT HOUSE, REPAIR SHOP	5465 HUDSON ROAD
7343	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7344	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD

ASSESSMENT (Sea Level Rise: 12ft, Tabular)

BUILDING	NAME	ADDRESS
337	ADMIN, GEN PURP	5895 WILSON ROAD
338	BOAT MAINTENANCE FACILITY	5945 WILSON ROAD
339	464TH BOAT COMPANY TRAILER	5945 WILSON ROAD
349	STOREHOUSE, GEN PURP	6001 WILSON ROAD
367	GEN PURP LAB	5858 WILSON ROAD
691	TRAVEL CAMP CHECK-IN BLDG	10200 JOHNSON ROAD
698	SEWAGE PUMPING STATION	10280 KNIGHT ROAD
778	MWR OUTDOOR RECREATION	10155 JOHNSTON ROAD
1575	SEWAGE PUMPING STATION	5700 SURVEYOR ROAD
1601	FAMILY HOUSING	5454 HUDSON/9120 DELAWARE ROADS
1602	FAMILY HOUSING	9119 DELAWARE/5452 HUDSON ROADS
1603	FAMILY HOUSING	5450/5448 HUDSON ROAD
1604	FAMILY HOUSING	5446/5444 HUDSON ROAD
1605	FAMILY HOUSING	5442/5440 HUDSON ROAD
1606	FAMILY HOUSING	5438/5436 HUDSON ROAD
1607	FAMILY HOUSING	5434/5432 HUDSON ROAD
1608	FAMILY HOUSING	5430/5428 HUDSON ROAD
1609	FAMILY HOUSING	9124/9122 SHENANDOAH ROAD
1610	FAMILY HOUSING	5501/5503 JAMES ROAD
1611	FAMILY HOUSING	5505/5507 JAMES ROAD
1612	FAMILY HOUSING	5509/5511 JAMES ROAD
1613	FAMILY HOUSING	5515/5517 JAMES ROAD
1614	FAMILY HOUSING	5519/5521 JAMES ROAD
1615	FAMILY HOUSING	5523/5525 JAMES ROAD
1616	FAMILY HOUSING	5527 JAMES/9115 DELAWARE ROADS
1617	FAMILY HOUSING	9118/9116 DELAWARE ROAD
1618	FAMILY HOUSING	9114/9112 DELAWARE ROAD
1619	FAMILY HOUSING	9110/9108 DELAWARE ROAD
1620	FAMILY HOUSING	9109/9111 DELAWARE ROAD
1621	FAMILY HOUSING	5524/5522 JAMES ROAD
1622	FAMILY HOUSING	5520/5518 JAMES ROAD
1623	FAMILY HOUSING	5516/5514 JAMES ROAD
1624	FAMILY HOUSING	5512/5510 JAMES ROAD
1625	FAMILY HOUSING	5508/5506 JAMES ROAD
1626	FAMILY HOUSING	5500 JAMES/9110 SHENANDOAH ROADS
1627	FAMILY HOUSING	9106 SHENANDOAH/5405 YORK ROADS
1628	FAMILY HOUSING	5407/5409 YORK ROAD
1629	FAMILY HOUSING	5411/5413 YORK ROAD
1630	FAMILY HOUSING	5415/5417 YORK ROAD
1631	FAMILY HOUSING	5419/5421 YORK ROAD
1638	FAMILY HOUSING	5420 YORK/9104 RAPPAHANNOCK ROADS
1641	FAMILY HOUSING	9105 RAPPAHANNOCK/5410 YORK ROADS
1642	FAMILY HOUSING	5404 YORK/9104 SHENANDOAH ROADS
1644	FAMILY HOUSING	9101/9103 SHENANDOAH ROAD
1645	FAMILY HOUSING	9105 SHENANDOAH/5402 YORK ROADS
1646	FAMILY HOUSING	5403 YORK/9107 SHENANDOAH ROADS
1647	FAMILY HOUSING	9109/9111 SHENANDOAH ROAD
1648	FAMILY HOUSING	9115/9117 SHENANDOAH ROAD
1649	FAMILY HOUSING	9119/9121 SHENANDOAH ROAD
1650	FAMILY HOUSING	9123/9125 SHENANDOAH ROAD
1651	FAMILY HOUSING	5420/5418 HUDSON ROAD

BUILDING	NAME	ADDRESS
1652	FAMILY HOUSING	5416/5414 HUDSON ROAD
1653	FAMILY HOUSING	5412/5410 HUDSON ROAD
1654	FAMILY HOUSING	5408/5406 HUDSON ROAD
1655	FAMILY HOUSING	9208/9206 POTOMAC LOOP
1656	FAMILY HOUSING	9289/9287 POTOMAC LOOP
1657	FAMILY HOUSING	9285/9283 POTOMAC LOOP
1658	FAMILY HOUSING	9281/9279 POTOMAC LOOP
1659	FAMILY HOUSING	9277/9275 POTOMAC LOOP
1660	FAMILY HOUSING	9273/9271 POTOMAC LOOP
1661	FAMILY HOUSING	9269 POTOMAC LOOP/5401 YORK ROAD
1662	FAMILY HOUSING	5400 YORK ROAD/9259 POTOMAC LOOP
1666	FAMILY HOUSING	9264/9266 POTOMAC LOOP
1667	FAMILY HOUSING	9268/9270 POTOMAC LOOP
1668	FAMILY HOUSING	9272/9274 POTOMAC LOOP
1669	FAMILY HOUSING	9276/9278 POTOMAC LOOP
1670	FAMILY HOUSING	9220/9222 POTOMAC LOOP
1681	FAMILY HOUSING	9225/9223 POTOMAC LOOP
1682	FAMILY HOUSING	9221/9219 POTOMAC LOOP
1683	FAMILY HOUSING	9217/9215 POTOMAC LOOP
1684	FAMILY HOUSING	9211/9209 POTOMAC LOOP
1685	FAMILY HOUSING	9207/9205 POTOMAC LOOP
1686	FAMILY HOUSING	9203/9201 POTOMAC LOOP
1687	FAMILY HOUSING	5401/5403 HUDSON ROAD
1689	FAMILY HOUSING	5409/5411 HUDSON ROAD
1690	FAMILY HOUSING	5413/5415 HUDSON ROAD
1691	FAMILY HOUSING	5417/5419 HUDSON ROAD
1692	FAMILY HOUSING	5421/5423 HUDSON ROAD
1693	FAMILY HOUSING	5425/5427 HUDSON ROAD
1694	FAMILY HOUSING	5429/5431 HUDSON ROAD
1695	SEWAGE PUMPING STATION	5457 HUDSON ROAD
1696	BOAT HOUSE, REPAIR SHOP	5465 HUDSON ROAD
3925	FAMILY HOUSING	9118 STATESMAN ROAD
3926	FAMILY HOUSING	9120 STATESMAN ROAD
3927	FAMILY HOUSING	9122 STATESMAN ROAD
3951	FAMILY HOUSING	9146 STATESMAN ROAD 5700 DLEGATE ROAD
3967	FAMILY HOUSING	9150 MOUNT VERNON ROAD 5701 DELEGATE ROAD
3971	FAMILY HOUSING	9158 MOUNT VERNON ROAD 5700 INVENTOR ROAD
7343	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7344	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7377	STOREHOUSE, FLAMMABLE MTRL	WILSON ROAD
GARAGE	DETACHED GARAGE	GARAGE
GARAGE	DETACHED GARAGE	GARAGE
GARAGE	DETACHED GARAGE	GARAGE
GARAGE	DETACHED GARAGE	GARAGE
GARAGE	DETACHED GARAGE	GARAGE
GARAGE	DETACHED GARAGE	GARAGE
GUARD BOOTH	GUARD BOOTH	MOUNT VERNON ROAD
NON_US_GOV	FAIRFAX SEWER LIFT STATION	BACHE ROAD
TRAILER	TRAILER	MOUNT VERNON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD

ASSESSMENT (100 Year, 1% Chance Flood, Tabular)

BUILDING	NAME	ADDRESS
337	ADMIN, GEN PURP	5895 WILSON ROAD
338	BOAT MAINTENANCE FACILITY	5945 WILSON ROAD
339	464TH BOAT COMPANY TRAILER	5945 WILSON ROAD
698	SEWAGE PUMPING STATION	10280 KNIGHT ROAD
778	MWR OUTDOOR RECREATION	10155 JOHNSTON ROAD
1400	HOMELESS SHELTER	9155 RICHMOND HIGHWAY
1407	GUARD BOOTH	POHICK ROAD
1409	VISITOR PROCESSING CENTER	9500 POHICK ROAD
1424	PUMP STATION	POHICK ROAD
1495	APPLIED INSTR, POWER TNG STA	6170 SHARON LANE ROAD
1601	FAMILY HOUSING	5454 HUDSON/9120 DELAWARE ROADS
1602	FAMILY HOUSING	9119 DELAWARE/5452 HUDSON ROADS
1603	FAMILY HOUSING	5450/5448 HUDSON ROAD
1604	FAMILY HOUSING	5446/5444 HUDSON ROAD
1605	FAMILY HOUSING	5442/5440 HUDSON ROAD
1606	FAMILY HOUSING	5438/5436 HUDSON ROAD
1607	FAMILY HOUSING	5434/5432 HUDSON ROAD
1608	FAMILY HOUSING	5430/5428 HUDSON ROAD
1609	FAMILY HOUSING	9124/9122 SHENANDOAH ROAD
1610	FAMILY HOUSING	5501/5503 JAMES ROAD
1611	FAMILY HOUSING	5505/5507 JAMES ROAD
1612	FAMILY HOUSING	5509/5511 JAMES ROAD
1613	FAMILY HOUSING	5515/5517 JAMES ROAD
1614	FAMILY HOUSING	5519/5521 JAMES ROAD
1615	FAMILY HOUSING	5523/5525 JAMES ROAD
1616	FAMILY HOUSING	5527 JAMES/9115 DELAWARE ROADS
1617	FAMILY HOUSING	9118/9116 DELAWARE ROAD
1618	FAMILY HOUSING	9114/9112 DELAWARE ROAD
1619	FAMILY HOUSING	9110/9108 DELAWARE ROAD
1621	FAMILY HOUSING	5524/5522 JAMES ROAD
1622	FAMILY HOUSING	5520/5518 JAMES ROAD
1623	FAMILY HOUSING	5516/5514 JAMES ROAD
1624	FAMILY HOUSING	5512/5510 JAMES ROAD
1625	FAMILY HOUSING	5508/5506 JAMES ROAD
1626	FAMILY HOUSING	5500 JAMES/9110 SHENANDOAH ROADS
1627	FAMILY HOUSING	9106 SHENANDOAH/5405 YORK ROADS
1645	FAMILY HOUSING	9105 SHENANDOAH/5402 YORK ROADS
1646	FAMILY HOUSING	5403 YORK/9107 SHENANDOAH ROADS
1647	FAMILY HOUSING	9109/9111 SHENANDOAH ROAD
1648	FAMILY HOUSING	9115/9117 SHENANDOAH ROAD
1649	FAMILY HOUSING	9119/9121 SHENANDOAH ROAD
1650	FAMILY HOUSING	9123/9125 SHENANDOAH ROAD
1651	FAMILY HOUSING	5420/5418 HUDSON ROAD
1652	FAMILY HOUSING	5416/5414 HUDSON ROAD
1653	FAMILY HOUSING	5412/5410 HUDSON ROAD
1654	FAMILY HOUSING	5408/5406 HUDSON ROAD

BUILDING	NAME	ADDRESS
1655	FAMILY HOUSING	9208/9206 POTOMAC LOOP
1658	FAMILY HOUSING	9281/9279 POTOMAC LOOP
1669	FAMILY HOUSING	9276/9278 POTOMAC LOOP
1670	FAMILY HOUSING	9220/9222 POTOMAC LOOP
1683	FAMILY HOUSING	9217/9215 POTOMAC LOOP
1684	FAMILY HOUSING	9211/9209 POTOMAC LOOP
1685	FAMILY HOUSING	9207/9205 POTOMAC LOOP
1686	FAMILY HOUSING	9203/9201 POTOMAC LOOP
1687	FAMILY HOUSING	5401/5403 HUDSON ROAD
1689	FAMILY HOUSING	5409/5411 HUDSON ROAD
1690	FAMILY HOUSING	5413/5415 HUDSON ROAD
1691	FAMILY HOUSING	5417/5419 HUDSON ROAD
1692	FAMILY HOUSING	5421/5423 HUDSON ROAD
1693	FAMILY HOUSING	5425/5427 HUDSON ROAD
1694	FAMILY HOUSING	5429/5431 HUDSON ROAD
1695	SEWAGE PUMPING STATION	5457 HUDSON ROAD
1696	BOAT HOUSE, REPAIR SHOP	5465 HUDSON ROAD
2950	CHLORINATOR BLDG	TELEGRAPH ROAD
2950	CHLORINATOR BLDG	TELEGRAPH ROAD
3121	AIRCRAFT HANGER (DCNG)	7000 BRITTEN DRIVE
3201	SENTRY STATION	JOHN J KINGMAN ROAD
3231	AIRCRAFT HANGAR	8932 GAVIN ROAD
3232	AIRCRAFT HANGAR	8920 GAVIN ROAD
3233	HEAT PLANT	8940 GAVIN ROAD
3234	AFLD OPNS BLDG	8938 GAVIN ROAD
3235	AVN UNIT OPNS BLDG	8926 GAVIN ROAD
3236	STOREHOUSE, FLAMMABLE MTRL	SANTJER ROAD
3237	AFLD, FIRE AND RESCUE	8946 GAVIN ROAD
3238	DISTR TRANSFORMER	SANTJER ROAD
3239	AFLD LIGHTING, EQUIP VAULT	8945 GAVIN ROAD
3240	FIRE TRAINING FACILITY	DAVISON AIRFIELD
3241	ORGANIZATION STORAGE BUILDING	DAVISON AIRFIELD
3242	AIRFIELD FIRE STATION	8915 GAVIN ROAD
3244	DAAF FLIGHT TOWER	8925 GAVIN ROAD
3260	SENTRY STATION	SANTJER ROAD
7343	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7344	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7375	PUMP HOUSE	5995 WILSON ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	JOHN J KINGMAN ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
NON_US_GOV	FAIRFAX SEWER LIFT STATION	BACHE ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD

ASSESSMENT (500 Year, 0.2% Chance Flood, Tabular)

BUILDING	NAME	ADDRESS
337	ADMIN, GEN PURP	5895 WILSON ROAD
338	BOAT MAINTENANCE FACILITY	5945 WILSON ROAD
339	464TH BOAT COMPANY TRAILER	5945 WILSON ROAD
698	SEWAGE PUMPING STATION	10280 KNIGHT ROAD
778	MWR OUTDOOR RECREATION	10155 JOHNSTON ROAD
1400	HOMELESS SHELTER	9155 RICHMOND HIGHWAY
1407	GUARD BOOTH	POHICK ROAD
1409	VISITOR PROCESSING CENTER	9500 POHICK ROAD
1424	PUMP STATION	POHICK ROAD
1495	APPLIED INSTR, POWER TNG STA	6170 SHARON LANE ROAD
1601	FAMILY HOUSING	5454 HUDSON/9120 DELAWARE ROADS
1602	FAMILY HOUSING	9119 DELAWARE/5452 HUDSON ROADS
1603	FAMILY HOUSING	5450/5448 HUDSON ROAD
1604	FAMILY HOUSING	5446/5444 HUDSON ROAD
1605	FAMILY HOUSING	5442/5440 HUDSON ROAD
1606	FAMILY HOUSING	5438/5436 HUDSON ROAD
1607	FAMILY HOUSING	5434/5432 HUDSON ROAD
1608	FAMILY HOUSING	5430/5428 HUDSON ROAD
1609	FAMILY HOUSING	9124/9122 SHENANDOAH ROAD
1610	FAMILY HOUSING	5501/5503 JAMES ROAD
1611	FAMILY HOUSING	5505/5507 JAMES ROAD
1612	FAMILY HOUSING	5509/5511 JAMES ROAD
1613	FAMILY HOUSING	5515/5517 JAMES ROAD
1614	FAMILY HOUSING	5519/5521 JAMES ROAD
1615	FAMILY HOUSING	5523/5525 JAMES ROAD
1616	FAMILY HOUSING	5527 JAMES/9115 DELAWARE ROADS
1617	FAMILY HOUSING	9118/9116 DELAWARE ROAD
1618	FAMILY HOUSING	9114/9112 DELAWARE ROAD
1619	FAMILY HOUSING	9110/9108 DELAWARE ROAD
1620	FAMILY HOUSING	9109/9111 DELAWARE ROAD
1621	FAMILY HOUSING	5524/5522 JAMES ROAD
1622	FAMILY HOUSING	5520/5518 JAMES ROAD
1623	FAMILY HOUSING	5516/5514 JAMES ROAD
1624	FAMILY HOUSING	5512/5510 JAMES ROAD
1625	FAMILY HOUSING	5508/5506 JAMES ROAD
1626	FAMILY HOUSING	5500 JAMES/9110 SHENANDOAH ROADS
1627	FAMILY HOUSING	9106 SHENANDOAH/5405 YORK ROADS
1628	FAMILY HOUSING	5407/5409 YORK ROAD
1629	FAMILY HOUSING	5411/5413 YORK ROAD
1630	FAMILY HOUSING	5415/5417 YORK ROAD
1631	FAMILY HOUSING	5419/5421 YORK ROAD
1632	FAMILY HOUSING	5423/5425 YORK ROAD
1638	FAMILY HOUSING	5420 YORK/9104 RAPPAHANNOCK ROADS
1641	FAMILY HOUSING	9105 RAPPAHANNOCK/5410 YORK ROADS
1642	FAMILY HOUSING	5404 YORK/9104 SHENANDOAH ROADS
1645	FAMILY HOUSING	9105 SHENANDOAH/5402 YORK ROADS
1646	FAMILY HOUSING	5403 YORK/9107 SHENANDOAH ROADS
1647	FAMILY HOUSING	9109/9111 SHENANDOAH ROAD
1648	FAMILY HOUSING	9115/9117 SHENANDOAH ROAD
1649	FAMILY HOUSING	9119/9121 SHENANDOAH ROAD
1650	FAMILY HOUSING	9123/9125 SHENANDOAH ROAD

BUILDING	NAME	ADDRESS
1651	FAMILY HOUSING	5420/5418 HUDSON ROAD
1652	FAMILY HOUSING	5416/5414 HUDSON ROAD
1653	FAMILY HOUSING	5412/5410 HUDSON ROAD
1654	FAMILY HOUSING	5408/5406 HUDSON ROAD
1655	FAMILY HOUSING	9208/9206 POTOMAC LOOP
1658	FAMILY HOUSING	9281/9279 POTOMAC LOOP
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1686	FAMILY HOUSING	9203/9201 POTOMAC LOOP
1687	FAMILY HOUSING	5401/5403 HUDSON ROAD
1689	FAMILY HOUSING	5409/5411 HUDSON ROAD
1690	FAMILY HOUSING	5413/5415 HUDSON ROAD
1691	FAMILY HOUSING	5417/5419 HUDSON ROAD
1692	FAMILY HOUSING	5421/5423 HUDSON ROAD
1693	FAMILY HOUSING	5425/5427 HUDSON ROAD
1694	FAMILY HOUSING	5429/5431 HUDSON ROAD
1695	SEWAGE PUMPING STATION	5457 HUDSON ROAD
1696	BOAT HOUSE, REPAIR SHOP	5465 HUDSON ROAD
2950	CHLORINATOR BLDG	TELEGRAPH ROAD
2950	CHLORINATOR BLDG	TELEGRAPH ROAD
3121	AIRCRAFT HANGER (DCNG)	7000 BRITTEN DRIVE
3201	SENTRY STATION	JOHN J KINGMAN ROAD
3231	AIRCRAFT HANGAR	8932 GAVIN ROAD
3232	AIRCRAFT HANGAR	8920 GAVIN ROAD
3233	HEAT PLANT	8940 GAVIN ROAD
3234	AFLD OPNS BLDG	8938 GAVIN ROAD
3235	AVN UNIT OPNS BLDG	8926 GAVIN ROAD
3236	STOREHOUSE, FLAMMABLE MTRL	SANTJER ROAD
3237	AFLD, FIRE AND RESCUE	8946 GAVIN ROAD
3238	DISTR TRANSFORMER	SANTJER ROAD
3239	AFLD LIGHTING, EQUIP VAULT	8945 GAVIN ROAD
3240	FIRE TRAINING FACILITY	DAVISON AIRFIELD
3241	ORGANIZATION STORAGE BUILDING	DAVISON AIRFIELD
3242	AIRFIELD FIRE STATION	8915 GAVIN ROAD
3244	DAAF FLIGHT TOWER	8925 GAVIN ROAD
3260	SENTRY STATION	SANTJER ROAD
7343	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7344	ORGANIZATION STORAGE BUILDING	5945 WILSON ROAD
7375	PUMP HOUSE	5995 WILSON ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
GUARD BOOTH	GUARD BOOTH	JOHN J KINGMAN ROAD
GUARD BOOTH	GUARD BOOTH	POHICK ROAD
NON_US_GOV	FAIRFAX SEWER LIFT STATION	BACHE ROAD
TRAILER	TRAILER	MOUNT VERNON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD
UNASSIGNED	STORAGE BUILDING	10155 JOHNSTON ROAD