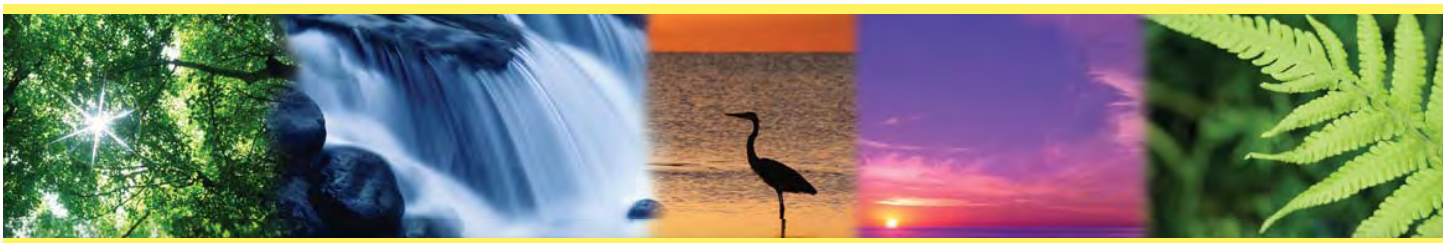
NAVFAC Atlantic Biological Resource Services

Contract: N62470-08-D-1008; Task Order: 0002

October 2010



FINAL
Integrated Natural Resources Management Plan, Naval Weapons Station Yorktown (2010-2020)

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

NAVAL WEAPONS STATION YORKTOWN

Plan Years

2010 - 2020

Approving Officials:

Installation Commanding Officer	Date
Atlantic Division Naval Facilities Engineering Command Natural/Cultural Resources Section	Date
Installation Natural Resources Manager	Date

Annual Review	**Date**

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Installation Commanding Officer	14 NOV 12 Date
Naval Facilities Engineering Command, Atlantic Natural Resources Section	10-16-12 Date
Installation Natural Resources Manager	14 Nov 12 Date
W. Emmett Caraway Regional Natural Resources Manager	12/15/10 Date
Cynthia A. Schulz U.S. Fish and Wildlife Service	12/19/12 Date
Virginia Department of Game and Inland Fisheries	2/3/11 Date

Enclosure (2)

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LIST OF ACRONYMS AND ABBREVIATIONS

AARR-F	average annual reduction rate-females
AARR-M	average annual reduction rate-males
AOC	area of concern
APHIS-WS	Animal and Plant Health Inspection Service-Wildlife Services
BMP	best management practice
BRAC	Base Realignment Closures
C2K	2000 Chesapeake 2000 Agreement
CAA	Clean Air Act
CAX	Cheatham Annex
CECOS	Civil Engineering Corps Officers School
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIR	color infrared
CNHP	Colonial National Historical Park
CNO	Chief of Naval Operations
CNRMA	Commander, Navy Region, Mid-Atlantic
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DBH	diameter breast height
DENIX	Defense Environmental Network and Information Exchange
DMAP	Deer Management Assistance Program
DNH	Division of Natural Heritage
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoN	Department of the Navy
EA	Environmental Assessment
EO	Executive Order
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
EPR	environmental program requirements
ERL	Environmental Readiness Level
ESA	Endangered Species Act
ESI	environmental sensitivity index
ESQD	explosive safety quantity distance
°F	Degree Fahrenheit
FACEUP	Federal Agencies' Chesapeake Ecosystem Unified Plan
FDR	fawn doe ratio
FEMA	Federal Emergency Management Agency
FFA	Federal Facilities Agreement
FIC	facility incident commander
FISC	Fleet Industrial Supply Center
FONSI	Finding of No Significant Impact
GIS	geographic information system
GMI	Geo-Marine, Inc.

LIST OF ACRONYMS AND ABBREVIATIONS (cont'd)

GRC	GeoReadiness Center
HARPP	Historic and Archaeological Resources Protection Plan
HD	hemorrhagic disease
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPM	integrated pest management
IRP	installation restoration program
NAVFAC Atlantic	Atlantic Division, Naval Facilities Engineering Command
MBTA	Migratory Bird Treaty Act
MILCON	military construction
mm	millimeters
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MWR	Morale, Welfare, and Recreation
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NORTHDIV	Northeast Atlantic Division, Naval Facilities Engineering Command
NOSC	Navy On-Scene Coordinator
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWP	Nationwide Permit
NWI	National Wetlands Inventory
O&MN	Operations and Maintenance, Navy
ODCP	Plan and Oil Discharge Contingency Plan
OHS	oil and hazardous substances
OHSFRP	Oil and Hazardous Substance Facility Response Plan
OMB	Office of Management and Budget
OPNAVINST	Chief of Naval Operations Operating Instruction
PIF	Partners in Flight
ppt	parts per thousand
PWC	public works center
RMA	resource management area
RPA	resource protection area
RPM	Remedial Project Manager
SAIA	Sikes Act Improvement Act
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer
SMP	Site Management Plan
SPCCP	Spill Prevention, Control, and Countermeasures Plan
SSA	site screening areas
SWP3	Storm Water Pollution Prevention Plan

LIST OF ACRONYMS AND ABBREVIATIONS (cont'd)

TNT	trinitrotoluene
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDOF	Virginia Department of Forestry
VIMS	Virginia Institute of Marine Science
VPDES	Virginia Pollutant Discharge Elimination System
WFMP	Wildland Fire Management Plan
WPNSTA	Weapons Station
YFT	Yorktown Fuel Terminal

EXECUTIVE SUMMARY

The Department of Defense (DoD) manages approximately 30 million acres of land in the United States (Benton et al. 2008). Each military installation that has suitable habitat for conserving and managing natural ecosystems and resources is required to prepare, maintain, and implement an Integrated Natural Resources Management Plan (INRMP). This INRMP was prepared for Naval Weapons Station Yorktown (Station) in accordance with:

- 32 Code of Federal Regulations (CFR) Part 190, Department of Defense (DoD) Natural Resources Management Program, July 1, 2009;
- DoD Instruction (DoDI) 4715.3, Environmental Conservation Program, May 3, 1996;
- Chief of Naval Operations Operating Instruction (OPNAVINST) 5090.1C Environmental Readiness Program Manual, Chapter 24, Natural Resources Management, October 29, 2007;
- 16 U.S. Code (USC) §670 a-f, the Sikes Act Improvement Act, November 18, 1997, and amendments;
- NAVFAC Natural Resources Management Procedural Manual, P-73, Vol. II; and,
- Conserving Biodiversity on Military Lands: A Guide for Natural Resources Managers (Benton et al. 2008).

Scope

The Station is a complex of three parcels of land located in York and James City counties, Virginia; Weapons Station (WPNSTA), Cheatham Annex (CAX), and Yorktown Fuel Terminal (YFT). This INRMP addresses these three parcels to varying degrees depending on available information in regards to existing natural resources and represents the renewal and update of the 2005–2009 INRMP with new information as required by the regulations and mandates listed above. In particular, the addition of a 786-acre area to CAX represents the largest change effecting natural resources management for the Station since the 2005-2009 INRMP.

This INRMP incorporates ecosystem management and the encouragement of biodiversity as the basis for planning and management of the Navy's natural resources. The purpose of this document is to preserve and enhance ecosystem integrity and biological diversity for continued availability of those resources for military readiness and sustainability. Ecosystems are dynamic and Station requirements are subject to frequent modification, which requires flexibility in implementing the natural resources management program. To accommodate these changes, this INRMP will be reviewed and updated annually by Station personnel and revised and reapproved after five years in conjunction with Atlantic Division, Naval Facilities Engineering Command (NAVFAC Atlantic). Natural resources staff will have responsibility for maintaining the currency of this document.

Important elements of this INRMP include the following sections:

Section 1 - Introduction. This section provides a discussion of the purpose of the INRMP and the policies that drive it, goals of the INRMP, a brief overview of the history and mission of the Station, and an overview of natural resources management at the Station.

Section 2 - Existing Conditions. This section describes existing physical and natural conditions of Station lands. Included are climate, physiography, soils, hydrology, flora, fauna, and rare, threatened, and endangered species.

Section 3 – Environmental Management Strategy and Mission Sustainability. This section outlines the strategy for the management of natural resources at the Station and how mission sustainably will be achieved.

Section 4 - Natural Resources Management. A number of management topics relevant to the Station are discussed in this section to help identify opportunities and potential conflicts in natural resources management.

Section 5 - WPNSTA Natural Resources Management Units. This section provides discussion of natural resources management and recommendations for two management units with similar land use constraints and mission requirements at WPNSTA. Natural resources management actions are identified for each unit.

Section 6 - CAX Natural Resources Management Units. This section provides discussion of natural resources management and recommendations for three management units with similar land use constraints and mission requirements at CAX. Natural resources management actions are identified for each unit.

Section 7 - YFT Natural Resources Management Unit. This section provides discussion of natural resources management and recommendations for a single management unit at YFT. Natural resources management actions are identified for the unit.

Section 8 - INRMP Implementation. This section identifies funding resources, Navy funding priorities, and a detailed project implementation schedule.

Section 9 - Plan Updates. Space is provided for annual review comments and changes to be incorporated into the five-year update.

Section 10 - References. References and Internet resources that were used in the development of this document are listed in this section.

Appendices - Appendix A documents the mutual agreement of the U.S. Fish and Wildlife Service and Virginia Department of Game and Inland Fisheries and public review of the INRMP. An Environmental Assessment (EA) prepared for implementation of the 2005–2009 INRMP, which includes comments received from the cooperating agencies and the public are in Appendix A. Appendix B includes species lists for all plants, mammals, herpetofauna, and avifauna identified during biotic inventories and incidental observation at the Station, including results from 2009 field surveys of a recent expansion parcel at CAX. Appendix C contains technical guidance and information on grounds maintenance and tree care issues. Appendix D has Station deer harvest and other species data.

Appendix E has current Regional Navy Instructions; new instructions will be added to this section as they become final. Appendix F outlines Station forest management prescriptions.

GIS Management, Data Integration, Access and Reporting

The Commander, Navy Region Mid-Atlantic's (CNRMA) GeoReadiness Center (GRC) is the single, authoritative source and distribution point for all geospatial information within the area of responsibility of the Navy Mid-Atlantic Region and is managed by the Mid-Atlantic Facility Engineering Command Geographic Information System (GIS) Division. The GRC houses the most current geospatial information (including aerial photography) for the entire Navy Mid-Atlantic Region and provides access to the comprehensive data set and analysis tools to Regional and DOD decision makers/managers, sponsored contractors, and other sponsored individuals via a secure government Internet site. GIS data for the Station, including those environmental layers used for the development of this INRMP, can be accessed through this portal. Environmental planners, project managers, engineers and sponsored contractors are encouraged to use the portal to access GIS data for analysis, development of maps and project planning. In addition, the portal provides guidance documentation for the collection of new geospatial data.

Management Actions and Major Initiatives

The management actions identified for the natural resources program are intended to help installation commanders effectively manage natural resources to ensure Station lands remain available and in good condition to support the Station's military mission. These actions incorporate the principles of ecosystem management and are consistent with Navy policy on sustainable, multiple use of natural resources on Navy property. Natural resources management goals and objectives to be implemented during the plan period consider the following major initiatives identified in this INRMP:

- Manage Station lands to optimize habitat for the Station's rare species;
- Maximize implementation of environmentally beneficial landscaping practices, including reducing the area of mowed turf and expanding forested areas on Station lands;
- Manage Station hunting and fishing programs to maximize outdoor recreational opportunities and maintain the Station's deer population within carrying capacity;
- Improve opportunities for environmental education and awareness for Station personnel and the general public;
- Improve Station forest health and diversity through forest management activities such as timber stand improvements, stand thinnings, reforestation, and forest pest monitoring;
- Encourage implementation of integrated pest management practices throughout the Station; and,
- Ensure the National Environmental Policy Act planning and documentation process is implemented for proposed development or land use changes on Station lands.

1.0 OVERVIEW

1.1 Purpose and Authority

In accordance with 32 Code of Federal Regulations (CFR) Part 190, Department of Defense Instruction (DoDI) 4715.03, Chief of Naval Operations Operating Instruction (OPNAVINST) 5090.1C Chapter 24, and the Sikes Act (16 U.S. Code [USC] §670a-f), the Department of the Navy (DoN) must implement and maintain a balanced and integrated program for the management of natural resources. To facilitate the natural resources program, the Secretary of the DoN is further directed to prepare and implement an Integrated Natural Resources Management Plan (INRMP) for each military installation that has significant natural resources. The INRMP must ensure that natural resources management practices comply with all pertinent laws and regulations and, in accordance with Navy policy, must incorporate ecosystem management as the basis for planning and management. In addition, the Sikes Act requires the INRMP be prepared in cooperation with the Secretary of the Department of Interior, acting through the Director of the U.S. Fish and Wildlife Service (USFWS), and the head of the Virginia Department of Game and Inland Fisheries (VDGIF). The INRMP must reflect the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources. Such mutual agreement and cooperation will support the principles of ecosystem management by improving the management of ecosystems that cross federal, state, and private boundaries.

Under the Sikes Act Improvement Act (SAIA) of 1997, including all amendments, all new INRMPs must be submitted for public comment and review pursuant to the Council on Environmental Quality (CEQ) regulations for implementing procedural provisions of the National Environmental Policy Act (NEPA). INRMP updates are also to be considered for public review if changes in regards to the military use and natural resources goals and objectives are considered substantial enough to warrant additional environmental review.

1.2 Goals and Objectives

This INRMP is a long-term planning document that guides implementation of the natural resources program to help ensure support for the installation mission while protecting and enhancing installation resources for multiple use, sustainable yield and biological integrity. In accordance with 32 CFR 190, the SAIA, and OPNAVINST 5090.1C Chapter 24, this plan must provide for:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;
- Integration of and consistency among, the various activities conducted under the plan;

- Establishment of specific natural resources management goals and objectives and time frames for proposed actions;
- Sustained use by the public of natural resources to the extent such use is not inconsistent with the needs of the fish and wildlife resources;
- Public access to the military installation that is necessary and appropriate and subject to requirements that ensure safety and military security;
- Enforcement of natural resources laws and regulations;
- No net loss in the capability of military installation lands to support the military mission of the installation; and,
- Such other activities as the Secretary of the Navy determines appropriate.

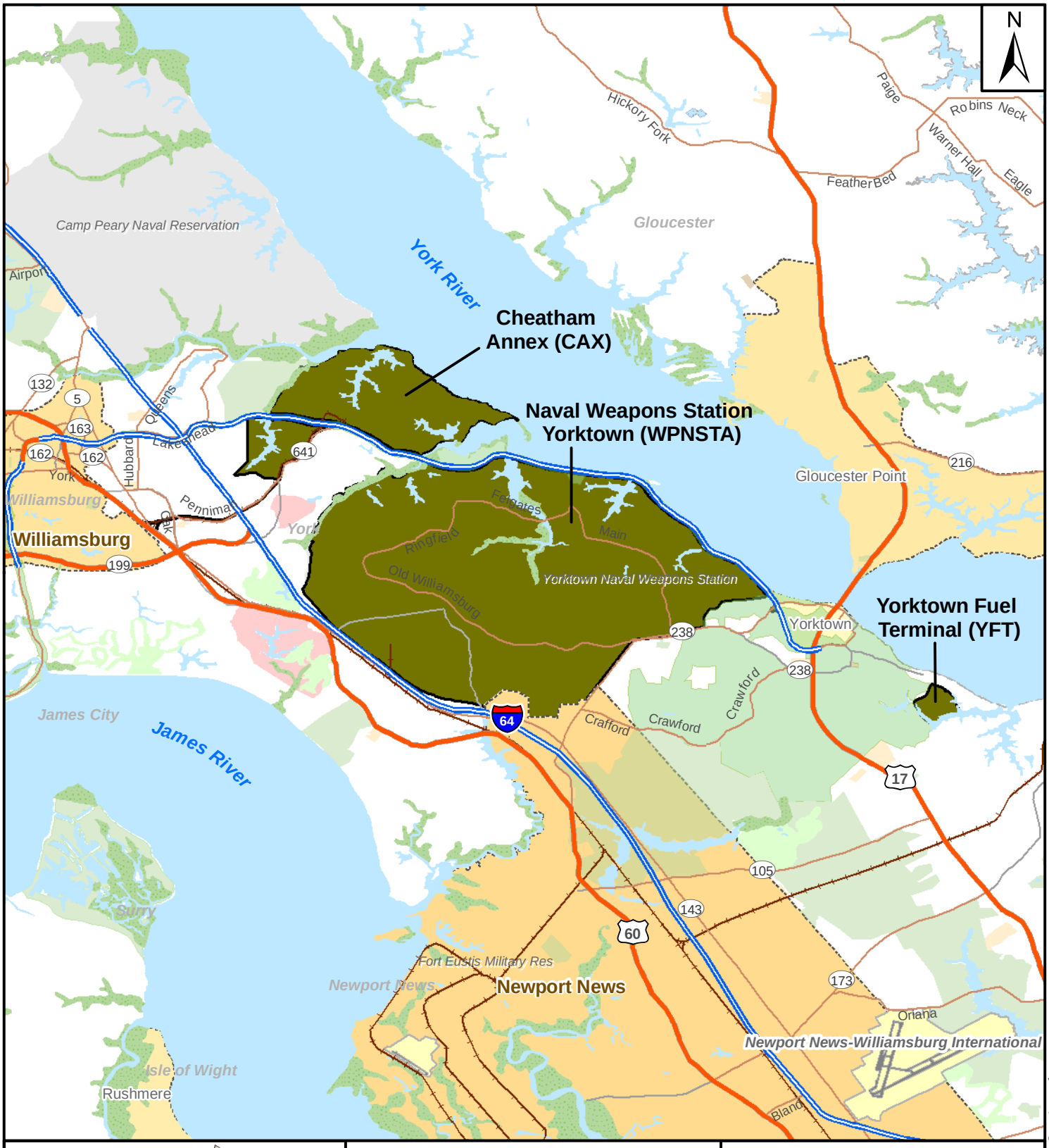
In addition, this INRMP provides the overarching goal of protecting the properties and functions of natural ecosystems through the incorporation of an ecosystem and adaptive management approach into Station fish and wildlife management, grounds maintenance, land restoration, endangered species, noxious plant and animal control, natural resource law enforcement, research, and overall conservation education programs.

This INRMP also provides the basis for updates to the Commander, Navy Region Mid-Atlantic's (CNRMA) GeoReadiness Center (GRC) geographic information system (GIS) database. Through the creation of the maps and figures for this INRMP, important natural resource data is updated at the GRC with current information obtained from Station resource managers, recent aerial photography, field surveys, and data provided by natural resource agencies. Ultimately, the GRC GIS database provides natural resources managers with a valuable analytical tool used to plan natural resources projects, as well as analyze impacts associated with land development actions.

1.3 Location and Regional Setting

Naval Weapons Station Yorktown (Station) is a complex of three formerly separate activities, and it encompasses the Weapons Station (WPNSTA), recently expanded Cheatham Annex (CAX), and Yorktown Fuel Terminal (YFT), which were brought under the administration of Station in 1998 and 1999 during a regional realignment of naval installations. All three parcels are on Virginia's Lower Peninsula between the York and James rivers (Figure 1-1).

The largest parcel, WPNSTA, encompasses approximately 10,320 acres in York and James City counties and the City of Newport News. Within this area, the WPNSTA strictly enforces a 600-foot standoff zone around the piers. Because of the explosives hazard zone associated with the explosives handling berth, the Station also purchased two small tidal flat islands in the York River, the Mumfort Islands as well as a small isolated parcel of land, referred to as the "bamboo patch", located along the Colonial National Historical Park (CNHP's) Colonial Parkway. The Colonial Parkway bounds the northwest WPNSTA boundary and additional CNHP land is adjacent to the southeastern and northwestern WPNSTA borders. Interstate 64 bounds the WPNSTA to the southwest. The small community of Lackey is adjacent to the southeast border.



Source: ESRI Data 2008.

0 1 2 Miles

0 1 2 Kilometers

Legend

Installation Areas

Figure 1-1. General Location and Regional Setting of Naval Weapons Station Yorktown.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

P:GIS/Projects/NAVFAC/MXD/Report/Figure1-1SiteLocation.mxd

CAX encompasses 2,298 acres to the northwest of the WPNSTA and is located entirely within York County. CAX comprises two parcels, including the main base and the Jones Millpond tract, which are separated by Colonial Parkway. York County New Quarter Park, Williamsburg Battlefield, and the Virginia Department of Emergency Services are the properties adjoining CAX. In 1979, the Navy transferred approximately 786 acres of land located within the Cheatham Pond watershed to the National Park Service (NPS). This parcel was managed by the NPS as part of the CNHP complex. In 2004, the Navy requested transfer of the parcel back to the Navy due to its capability to provide unique training opportunities in support of national security needs The addition of this 786-acre area to CAX represents the largest change effecting natural resources management for the Station since the 2005-2009 INRMP. However, this largely undeveloped area will be managed in the same manner as the original undeveloped portions as CAX. This area is referred to as the CAX expansion area throughout this INRMP.

YFT is a 138-acre parcel to the southeast of WPNSTA and is also located within York County. It is bounded by the U.S. Coast Guard Reserve Training Center, the West Branch of Wormley Creek, and CNHP. The majority of the Station boundaries used in this plan reflect the results of a 2002 survey of the Station and NPS boundary (Rickmond Engineering, Inc. 2002).

The Station is part of a large contiguous area of publicly owned land on the Peninsula that includes CNHP, Camp Peary Naval Reservation, Newport News Park and watershed protection areas, and various York County parks. Although these facilities have very different missions, each supports large areas of undeveloped land that play a key role in the health and sustainability in the region's natural ecosystems and protection of the Chesapeake Bay watershed in an area that is generally undergoing rapid development. Through participation in regional plans such as the Chesapeake Bay Agreement and coordination of management efforts, these facilities have the potential to greatly enhance the protection of significant regional natural and cultural resources.

1.4 Historical Overview and Mission

1.4.1 Military History

In 1918, the land surrounding the port of Yorktown was taken by Presidential Proclamation to establish the Navy Mine Depot, Yorktown, a mine-loading plant and storage facility. The first carloads of material arrived at the mine depot for storage in July 1919. In 1932, the facility's name was changed from Navy Mine Depot to Naval Mine Depot. By 1941, the mine depot was the sole naval activity on the eastern seaboard capable of supplying the Navy with trinitrotoluene (TNT) for use in mines, warheads, bombs, depth charges, projectiles, and demolition charges. By 1943, Plant 2 at the Naval Mine Depot was the only source of the torpedo explosive, Torpex, on the continent. The plants also handled experimental explosives, modified various experimental containers for explosives testing, and developed loading and assembly procedures for new containers. Skiffes Creek Annex was commissioned in 1953. Naval Mine Depot, Yorktown supplied drag bombs for use throughout the Korean War, and the depot name was changed in 1958 from Naval Mine Depot to Naval Weapons Station. WPNSTA produced MK 80-series bombs in support of the Vietnam Conflict and over 40 percent of the tomahawk missiles used in Operations Desert Shield and Desert Storm. However, beginning in 1993 with

operation downsizing and mission changes, demolition was begun on many of the Station's plants, facilities, and infrastructure.

During World War I, prior to Navy ownership, E.I. DuPont de Nemours & Company built a large gunpowder factory and shell-loading plant on the land now occupied by CAX. The site was referred to as the City of Penniman and housed approximately 10,000 people. After World War I, the powder plant was disassembled, and the land was used for grazing and farming. The Navy purchased the land in June of 1943 and Fleet Industrial Supply Center Cheatham Annex (FISC CAX) was established to augment the storage capacity of the Norfolk Naval Supply Station. The CAX site was ideal for Navy development because its harbor could be expanded to accommodate large seagoing vessels. During World War II, FISC CAX served as a principal assembly and shipping point for advance bases. All types of material were received, packed, and assembled in various warehouses and transit sheds for loading aboard ship. Since World War II, FISC CAX has served as a bulk and backup stock point for receiving, storing, packing, and shipping material under the cognizance of the Naval Supply Center in Norfolk, and for storage and special program efforts for other government agencies such as the Defense Supply Agency, Army, Marine Corps, Air Force, and Department of Health, Education, and Welfare.

The first construction of the YFT started in 1918 and was then known as the Navy Fuel Oil Station. The terminal consisted of eight 90,000-barrel storage tanks (concrete structures measuring 160 feet square and 24 feet deep), making this the largest fuel oil storage facility in the continental United States. In 1941, six 27,500-barrel storage tanks were constructed, and fourteen 50,000-barrel storage tanks were constructed in 1953. Also in 1953, a new fueling pier with 650 feet of berthing space for fuel operations was constructed. Today, YFT has 29 million gallons of storage facilities and receives, stores, and issues jet petroleum (JP-8) fuel for Air Force and Army use. A large portion of the terminal is undergoing installation restoration of its underground fuel tanks.

Navy operating support functions in the Mid-Atlantic Region were regionalized in 1998. As a result, the base support functions of FISC CAX, YFT, and WPNSTA were placed under the responsibility of designated program managers in the region. The three bases were combined under the command of the Commanding Officer, Naval Weapons Station Yorktown. FISC Norfolk Detachment still maintains a storefront presence at CAX with responsibility for regional supply support on the Peninsula.

1.4.2 Military Mission

WPNSTA currently hosts 25 tenant commands, which include the Atlantic Ordnance Command, Naval Ophthalmic Support and Training Activity, Marine Corps Second Fleet Anti-Terrorism Security Team, Fleet Industrial Supply Center Detachment, FISC, Navy Cargo Handling and Port Group, and 19 storefronts. The Station and tenant commands work together as a team to provide ordnance logistics, technical, supply, and related services to the Atlantic Fleet. The base mission is to provide responsive, quality support for ordnance logistics, technical, and related services to U.S. Operating Forces in support of national military strategy. CAX provides supply support services that include warehousing, inventory management, local delivery, fuel management and distribution, technical support, customer service, and care of sponsor-owned material primarily in support of Naval Ordnance missions. CAX has 18 warehouses and 10

tenant activities. The mission of YFT is to receive, store, and issue jet petroleum fuel to Defense Logistics Agency customers including Fort Eustis, Virginia, and Langley Air Force Base, Virginia.

1.5 National Environmental Policy Act

An INRMP is defined as a major federal action requiring NEPA analysis by the CEQ. As a result, the preparation of NEPA documentation is required prior to INRMP approval per SAIA requirements for INRMP implementation. Most installation INRMPs can meet the NEPA requirements with the preparation of an Environmental Assessment (EA). However, if the implementation of the INRMP will have a significant impact on the environment, an Environmental Impact Statement (EIS) must be prepared. It is expected that annual updates and revisions would be covered under the original NEPA documentation unless there has been a major change in the installations mission or program scope.

To fulfill these requirements, an EA and Finding of No Significant Impact (FONSI) was prepared for implementation of the 2005–2009 INRMP (Appendix A). For this INRMP update, changes in regards to the military use and natural resources goals and objectives for this installation are not considered substantial enough to warrant additional environmental and public review, beyond what was addressed by the EA prepared for the 2005–2009 INRMP. No major changes in installation mission or program scope have occurred since that time; therefore, no new NEPA documentation or opportunity for public review are required for this INRMP update. However, individual projects and actions identified in this INRMP may require further NEPA documentation. Therefore, the preparation of a new EA and FONSI are not warranted using criteria set forth by NEPA (see below). The EA and FONSI prepared for the 2005-2009 INRMP, and applicable to this update, are documented in Appendix A. EAs are made available for public comment and are forwarded to West Virginia's State Clearinghouse for state intergovernmental environmental review. EAs are also sent to/made available to non-governmental organizations that have expressed interest in the management of natural resources at the Station.

The EA compares and summarizes the potential environmental consequences of the proposed action and alternative management objectives rather than individual projects or practices. Natural resources program activities described in the EA, consist of activities such as routine forest management practices, administration of the Station's hunting and fishing program, conducting biological inventories, habitat enhancement using native species, and routine maintenance activities, which are categorically excluded from further NEPA documentation (OPNAVINST 5090.1C Chapter 24). Actions that are likely to require further NEPA documentation include actions that would:

- Negatively impact public health or safety;
- Significantly affect the human environment;
- Require an individual permit from the U.S. Army Corps of Engineers (USACE);
- Violate the Navy's "no net loss" of wetlands policy;

- Impact threatened or endangered species;
- Impact archeological or historical sites;
- Conflict with remediation activities; or,
- Generate controversy.

1.6 INRMP Review and Revision Process

In accordance with Navy INRMP Guidance (U.S. Navy 2006) this INRMP will be informally reviewed on an annual basis and formally reviewed every five years to evaluate its effectiveness. USFWS and state partners are invited to participate in each review of this INRMP. The web-based Metrics Builder tool on the Natural Resources Data Call Station website (https://clients.emainc.com/dcs/NR/userlogon.asp) is used to evaluate this INRMP during the review process. Seven areas of performance are evaluated with the Metrics Builder. These are as follows:

1) INRMP Implementation
2) Partnership/Cooperation and Effectiveness
3) Team Adequacy
4) INRMP Impact on the Installation Mission
5) Status of Federally Listed Species and Critical Habitat
6) Ecosystem Integrity
7) Fish and Wildlife Management and Public Use

Annual reviews with USFWS and state partners shall verify that:

1) All Environmental Readiness Level (ERL) 4 projects and activities have been budgeted for and implementation is on schedule.
2) All required trained natural resources positions are filled or are in the process of being filled.
3) Projects and activities for the upcoming year have been identified and included in the INRMP (an updated project list does not necessitate revising the INRMP).
4) All required coordination has occurred.
5) All significant changes to the installation's mission requirements or its natural resources have been identified.

Certain developments may necessitate an INRMP revision. These developments include but are not limited to:

1) A change in mission requirements or intensity of land use.
2) Significant change in natural resource baseline condition. For example, a substantial change in the population of a listed species or a new invasive species.
3) Old INRMP has proven inadequate, was unable to be implemented, or monitoring has shown projects to be ineffective in meeting natural resource management goals.

4) Natural resource management goals have changed or planning horizon of previous INRMP has expired.
5) Base Realignment and Closure (BRAC) actions.

If any of the above developments have taken place or are predicted to take place in the near future, USFWS and state partners should be notified during the review process. In many cases, the modifications would not trigger a new NEPA action and the existing EA will cover the modifications. If a change is determined to be a "significant" difference from the original INRMP, then additional NEPA analysis, such as a new EA or potentially an EIS, would be required.

1.7 Mission Impacts to Natural Resources

A number of direct and indirect impacts to natural resources have resulted from operational activities and past waste disposal practices on Station lands. Numerous sites containing debris, explosives residue, and other materials have been identified and the Navy's Installation Restoration Program (IRP) is conducting restoration and mitigation of contaminated soil, groundwater, and surface water resources. The potential for oil and hazardous materials spills also exists, but, as these materials are not transferred or stored in great quantities, environmental risks are considered minimal. At YFT, however, where storing and issuing fuels is the primary mission, fuel spills are the greatest potential impact to natural resources. Other impacts to natural resources include habitat loss and degradation of wetlands and water quality, which may occur as a result of the construction of new buildings, magazines, roads, and other infrastructure.

Virtually all of the natural resources at WPNSTA are located within the confines of explosives safety quantity distance (ESQD) arcs, and many occur within restricted areas (Figure 1-2). Security requirements necessitate restriction or severe limitation of access to these resources. These requirements primarily affect the management of the Station's natural resources for outdoor recreation. Mission activities essentially determine who can participate in certain outdoor recreation activities, as well as when and where those activities can take place.

Legend

- Installation Areas
- Explosive Safety Quantity Distance Arcs
- Restricted Area

Source: U.S. Navy 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 1-2. Explosive Safety Quantity Distance Arcs and the Restricted Area.

Prepared For:	NAVFAC Naval Facilities Engineering Command	
Prepared By:	TETRA TECH	**Date:** 04/2010

P:GIS/Projects/NAVFAC/MXD/Report/Figure1-2ExplosiveSaftey.mxd

1.8 Partnerships

The diversity of natural resources found at the Station creates the need for a variety of expertise and assistance in developing and implementing sound management practices. The development of partnerships with state and federal resources agencies, local colleges and universities, and local conservation groups makes such expertise available to natural resources personnel to accomplish set goals and objectives, and fosters good community relationships. The following is a list of groups and agencies that have formed significant partnerships with the Station.

- The USFWS provides technical assistance with plans on fish and wildlife issues, identification of threatened and endangered species and critical habitat consultation under Section 7 of the Endangered Species Act (ESA) of 1973, fish and wildlife census surveys, and law enforcement. The USFWS further provides field services and management recommendations to assist the Station in meeting its fisheries and management goals.
- The VDGIF provides statistical analysis of biological data collected during hunting season to help deer herd management.
- The Virginia Department of Forestry (VDOF) provides technical advice of forest operations and supplies plant materials for the establishment and maintenance of trees on the Station. VDOF also provides the Prescribed Burn Manager certification program.
- The U.S. Forest Service (USFS) provides assistance with forest pest suppression through a Memorandum of Agreement with DoD.
- The Virginia Native Plant Society provides expertise for the establishment of native plants at the Station.
- The Virginia Marine Resources Commission provides advice and assistance in enforcing state fishing regulations at the Station's recreational fishing pier in the York River.
- The Virginia Institute of Marine Science (VIMS) and the Virginia Marine Resources Commission partnered with Station natural resources staff to establish an artificial oyster reef at the mouth of Felgates Creek.
- The Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) provides support in identifying rare, threatened, and endangered plants, animals, and communities on the Station and in recommending protection guidelines.
- The Boy Scouts and Girl Scouts of America join in community cleanup efforts and bird nest box programs.
- The Williamsburg Bird Club has conducted numerous bird counts at CAX and has identified nearly 300 bird species on the Station.

2.0 CURRENT CONDITIONS AND USE

2.1 Climate

An understanding of general climate patterns is important to natural resources management. In particular, rainfall distribution and growing season influence forestry and planting activities, and wind direction and wind speed are important in planning prescribed burn operations. The climate summary in Table 2-1 includes data recorded at the Southeast Regional Climate Center in Williamsburg, Virginia from 1948 to 2007.

Table 2-1. Average Temperatures and Rainfall, Williamsburg (1948-2007).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max Temp (°F)	49	52	60	71	78	85	89	87	81	71	62	53	70
Min Temp (°F)	28	30	36	45	54	63	67	66	60	49	40	32	48
Ave Temp (°F)	38	41	48	58	66	74	78	77	71	60	51	43	59
Precip. (inches)	3.7	3.4	4.1	3.3	4.2	3.8	5.4	5.1	4.4	3.5	3.3	3.4	47.5

Source: Southeast Regional Climate Center 2009

January is typically the coldest month with an average temperature of 38° Fahrenheit (F), and July is typically the hottest month with an average temperature of 78°F. The average growing season (daily minimum temperatures greater than 28°F) is approximately 226 days and lasts from late March to early November. Average annual precipitation is 47.5 inches and is distributed fairly uniformly throughout the year, though July and August receive the most rainfall with nearly 5 inches or more per month and April and November receive the least rainfall with only 3.3 inches. The relative humidity averages about 80 percent at dawn, and 60 percent by mid-afternoon. The possibility of sunshine is 70 percent in summer and 60 percent in winter. The prevailing wind is from the southwest in summer and the northeast during winter with an average wind speed of 10 to 12 miles per hour.

2.2 Geology and Physiography

The Station is located within the Atlantic Coastal Plain physiographic province of Virginia. This province is characterized by a thick wedge of unconsolidated and semiconsolidated sediments including sand, silt, clay, gravel, and shell marl that extends from the fall line to the Atlantic Ocean. These sediments were deposited through successive periods of erosion and deposition during the Quaternary, Tertiary, and Cretaceous periods. The unconsolidated materials in the area are 1,000 to 2,000 feet deep and rest on a bed of igneous and metamorphic rock. Surficial sediments in the area are from the Quaternary period and are composed of fluvial and estuarine silt, sand, and clay. The oldest exposed deposits are from the Tertiary period. These deposits

compose the Yorktown Formation, which consists of marine and fossiliferous sand deposits, including shell marl and sands formed from crushed shell (limesand). Outcrops of the Yorktown Formation are visible in deeply eroded ravines and eroded bluffs. The Eastover Formation, consisting of marine sand and clay deposits, lies beneath the Yorktown Formation but is not exposed on the Station (Roberts and Bailey 2002).

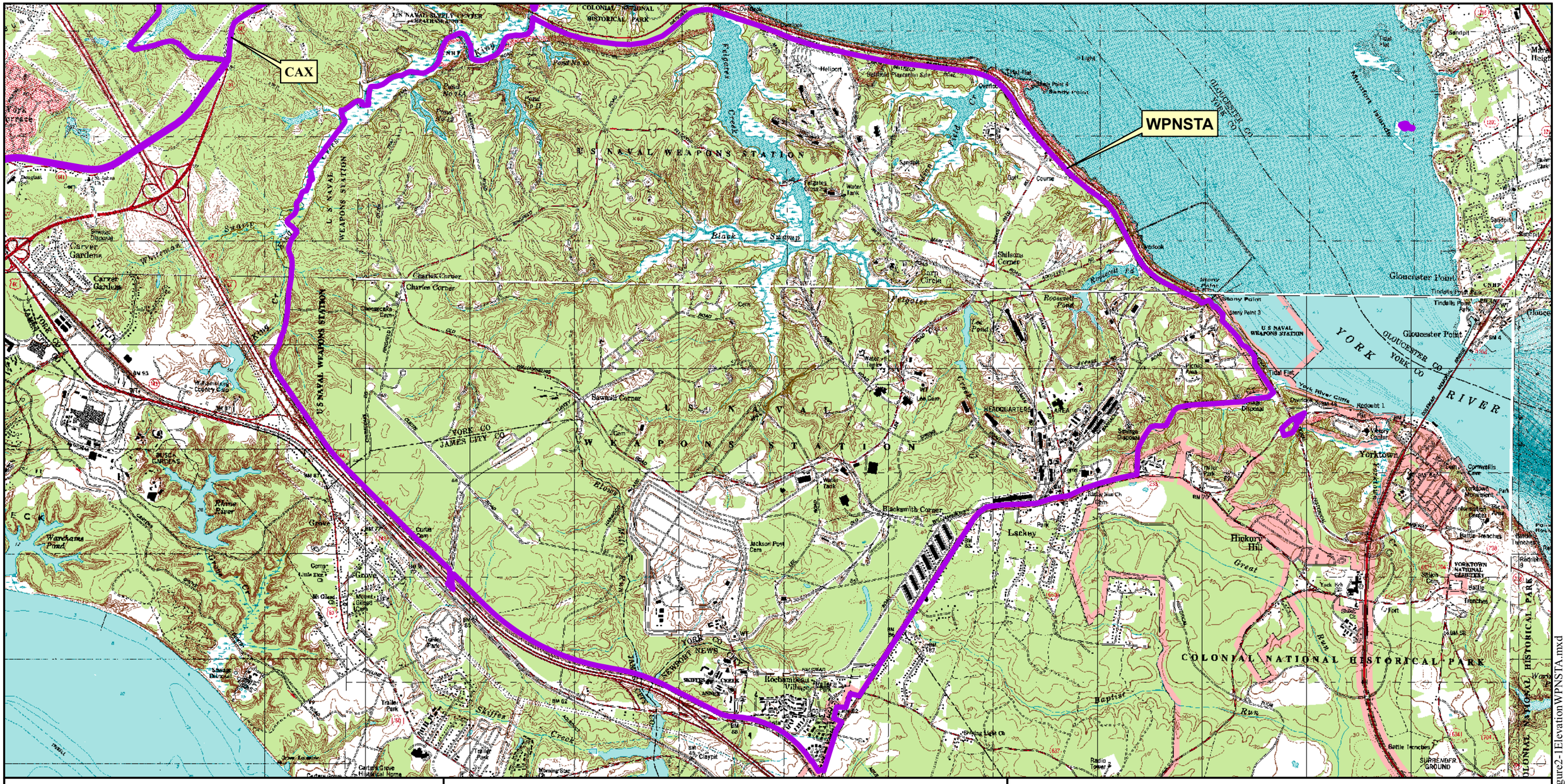
Surface relief at the Station is caused by a series of terraces and scarps that occur on the coastal plain. Elevations at WPNSTA range from mean sea level in the coastal marsh areas of the major creeks to approximately 110 feet above mean sea level on the high terraces in the southern and western portions (Figure 2-1). Elevations at CAX range from 4 feet above mean sea level in the marsh areas of the northeast to 90 feet above sea level in the hills surrounding Jones Millpond (Figure 2-2). Most of the land area at YFT has been leveled to accommodate fuel storage tanks. Elevation at the terminal ranges from about 60 feet to mean sea level around the perimeter of the property (Figure 2-2).

2.3 Soils

Soil surveys at WPNSTA were conducted in 1982 by Virginia Polytechnic Institute and State University and at CAX in 1985 by the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS). Twenty-four (24) soil types were identified at WPNSTA (Figure 2-3) and 16 were identified in the surveyed portions of CAX (Figure 2-4). Of these soil types at WPNSTA and CAX, 13 soil types may be considered major soil associations or complexes (i.e., more than 100 acres occur at WPNSTA and more than 50 acres occur at CAX). Table 2-2 describes several important characteristics of the major soils at WPNSTA and CAX. Soil survey data specific to YFT are not available; however, Udorthents (i.e., soils altered by cutting, filling, and/or excavation) are likely to be the dominant soil type as the property comprises mostly disturbed land.

Soils throughout the installations largely consist of sandy loam, silty loam, and loam surface soils and sandy clay loam, clay loam, and clay subsoils. The soils generally range from strongly acid to extremely acid though some neutral to alkaline soils also occur. Inherent fertility is generally low though a few soils range from medium to high. Organic matter content is generally low to medium in most upland soils. In many places throughout the Station's ravine system, soils have downcut into Tertiary shell deposits and support unique calciphytic ecological communities. Four major soils, including the Axis, Bethera, Bohicket, and Johnston series, are listed as hydric by the Natural Resources Conservation Service (NRCS 1993). Levy soils are another hydric soil that occurs at WPNSTA, but is not a major soil. Chickahominy is an additional wetland soil at CAX. The remainder of the soils are upland soils that are well-drained to moderately well-drained. Urban soils and Udorthents are other soil types that occur at the Station. Urban soils consist of areas where more than 85 percent of the surface is covered by impermeable surface such as concrete, asphalt, or buildings. Udorthents are soils that have been disturbed by excavation and grading and have had top soils removed.

The list of hydric soils in Virginia is available on the NRCS website:
http://soils.usda.gov/use/hydric/lists/state.html



Legend

- Installation Areas
- Contour Intervals (10 foot)

Source: USGS 7.5 Minute Qudrangles, Digital Raster Graphics (DRG). DRGs used: Clay Bank, Williamsburg, & Hog Island, Virginia 1984, and Yorktown, Virginia 1985.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 2-1. Elevation Contours at WPNSTA.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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CAX

YFT

WPNSTA

U S NAVAL SUPPLY CENTER

Fuel WT

West

0 500 1,000 Feet

0 120 240 Meters

CAMP PEARY AIRPORT

CAMP PEARY NAVAL RES

Tidal Flat

Grave

Porta Bello

CREEK

QUEEN CREEK

Cheatham Landing

Light

Pages Light

Tidal Flat

Cheatham Pond

COLONIAL NATIONAL HISTORICAL PARK

Cheatham Pond

U S NAVAL SUPPLY CENTER CHEATHAM ANNEX

Overlook

Golf Course

Kings Creek 3

Campground

Picnic Area

Penniman Lake

Penniman Spit

Ringfield Picnic Area

Point

Overlook

Heliport

Bellfield Plantation Site

Millpond

Jones

New Quarter Ch Cem

Hippa Pond

Creek

Pond No 10

Felgates

WEAPONS ST

Legend

Installation Areas

Contour Intervals (10 foot)

Source: USGS 7.5 Minute Qudrangles, Digital Raster Graphics (DRG).
DRGs used: Poquoson West, Virginia 1975 and Clay Bank and Williamsburg, Virginia 1984.

0 1,000 2,000 Feet

0 240 480 Meters

N

Figure 2-2. Elevation Contours at CAX and YFT.

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Prepared By: TETRA TECH

Date: 04/2010

P:GIS/Projects/NAVFAC/MXD/Report/Figure2-2ElevationCAX.mxd

CAX

WPNSTA

Legend

- Installation Areas
- Roads
- Altavista fine sandy loam
- Axis mucky loam*
- Bethera loam*
- Bohicket mucky silty clay loam*
- Bojac sandy loam
- Caroline fine sandy loam
- Craven fine sandy loam
- Craven-Uchee Complex
- Dogue loam
- Emporia Complex
- Emporia fine sandy loam
- Johnston Complex*
- Kempsville fine sandy loam
- Kempsville-Emporia Complex
- Levy mucky silty clay*
- Munden loamy fine sand
- Newflat silt loam
- Pamunkey soils
- Slagle fine sandy loam
- Slagle fine sandy loam-ponding phase
- Suffolk fine sandy loam
- Uchee loamy fine sand
- Udorthents loamy
- Urban Land
- Water
- Yemassee fine sandy loam

***Indicates Hydric Soil**

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Source: Virginia Polytechnic Institute and State University 1982, USDA SCS 1985.

Figure 2-3. Soils at WPNSTA.

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Prepared By: TETRA TECH

Date: 04/2010

P:GIS/Projects/NAVFAC/MXD/Report/Figure2-3SoilsWPNSTA.mxd

Soil Data Not Available For This Area

CAX

CAX

WPNSTA

Legend

- Installation Areas
- Roads
- Axis mucky loam*
- Beach
- Bohicket mucky silty clay loam*
- Bojac sandy loam
- Chickahominy silt loam*
- Craven-Uchee Complex
- Dogue loam
- Johnston Complex*
- Kempsville-Emporia Complex
- Munden loamy fine sand
- Newflat silt loam
- Pamunkey soils
- Slagle fine sandy loam
- Udorthents loamy
- Urban Land
- Water
- Yemassee fine sandy loam

***Indicates Hydric Soil**

0 1,000 2,000 Feet

0 240 480 Meters

N

Source: Virginia Polytechnic Institute and State University 1982, USDA SCS 1985.

Figure 2-4. Soils at CAX.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

P:\GIS\Projects\NAVFAC\MXD\Report\Figure2-4SoilsCAX.mxd

Table 2-2. Major Soils at Naval Weapons Station Yorktown.

Soil Series	Description[1]
Hydric Soils	
Axis	Very poorly drained, very fine sandy loam; occurs in areas that are inundated twice daily by saline or brackish water; medium acid to moderately alkaline; slopes are less than 1 percent
Bethera	Poorly drained silt loam; extremely acid; occurs in depressions on upland flats and has slopes from 0 to 2 percent
Bohicket	Very poorly drained, mucky silty clay loam; slightly acid to moderately alkaline; occurs in areas that are inundated twice daily by saline or brackish water; slopes are less than 1 percent
Johnston Complex	Very poorly drained soils of the Johnston series and other unclassified soils; very strongly acid to strongly acid; occurs on floodplains with slopes from 0 to 2 percent
Chickahominy	Poorly drained silt loam; extremely acid; occurs on low-lying flats and depressions along major rivers; slopes range from 0 to 2 percent
Nonhydric Soils	
Dogue	Moderately well-drained fine loam; ranges from neutral surface soils to very strongly acid subsoils; occurs on stream terraces along major streams and rivers; slopes range from 0 to 3 percent; erosion hazard is slight
Pamunkey	Deep, well-drained sandy loam; slightly to strongly acid; occurs on uplands of low stream terraces; slopes range from 2 to 6 percent; erosion hazard is moderate
Uchee	Well-drained fine sand; very strongly acid; occurs on upland ridges and side slopes; slopes range from 2 to 10 percent; erosion hazard is moderate
Emporia	Deep, well-drained soil of medium and broad upland ridges; very strongly acid; slopes range from 2 to 6 percent; erosion hazard is moderate
Emporia Complex	Moderately steep, well-drained soils of the Emporia series and other unclassified soils; severely eroded areas and outcrops of shell marl occur on steeper sites; springs and seeps may also occur; slopes range from 10 to 50 percent; erosion hazard is severe
Kempsville	Deep, well-drained fine sandy loam; very strongly acid; occurs on broad uplands and side slopes; slopes range from 2 to 6 percent; erosion hazard is moderate
Craven	Moderately well-drained fine sandy loam; very strongly to extremely acid; occurs on upland ridges and side slopes; slopes range from 2 to 10 percent; erosion hazard is moderate to severe
Slagle	Moderately well-drained fine sandy loam; very strongly acid; occurs on upland flats, slight depressions, and side slopes of small drainages; slopes range from 0 to 6 percent; erosion hazard is slight to moderate

[1] Does not include major soil type that may be at YFT or the CAX expansion area.

Sources: Virginia Polytechnic Institute and State University 1982 USDA SCS 1985

2.4 Hydrology

An understanding of the Station's hydrology, including its surface waters, watersheds, groundwater, floodplains, and wetlands, is important for protecting sensitive natural resources such as potable water supplies, fisheries, and unique natural resources, including threatened and endangered species and significant habitats. An understanding of the direction of surface water flow and watershed areas is particularly critical in the event of oil or other hazardous materials spill.

2.4.1 Surface Water

Surface waters of WPNSTA include four major, tidally influenced tributaries to the York River, numerous small creeks that flow through wooded ravines throughout the property, and six freshwater impoundments that were formed by damming or constricting outflows of natural drainage features on the Station. King Creek, Felgates Creek, Indian Field Creek, and Ballard Creek are tidally influenced tributaries that lie in the northern and central portions of the Station and drain into the York River. The centerline of Ballard Creek forms the eastern boundary of WPNSTA and is therefore only partly included in the Station's jurisdiction. Blows Mill Run and Skiffes Creek are nontidal creeks that drain into Skiffes Creek Reservoir to the south. Skiffes Creek Reservoir serves as a Newport News Waterworks drinking water supply reservoir. The six freshwater ponds at WPNSTA are artificial impoundments formed by damming portions of natural drainage features. Roosevelt Pond (15 acres) and Lee Pond (5 acres) are in the eastern portion of the Station. Ponds 10, 11, 11A, and 12 are along the northwest border. Pond 11, the largest, is 20 acres. Ponds 10, 11A, and 12 are approximately 5, 1, and 12, acres respectively. Figure 2-5 shows the location of surface water resources at WPNSTA.

The primary surface water resources at CAX consist of artificial impoundments formed by damming portions of natural drainages. Jones Millpond is a 45-acre pond located in the southwest section of the Station, south of the Colonial Parkway. It was formed by damming Cub Creek just below the Colonial Parkway overpass. Penniman Lake is a 45-acre lake created by damming a portion of King Creek. The dam separates Penniman Lake from tidal influence of King Creek. Cheatham Pond is 108 acres, the majority of which occurs in the 786-acre CAX expansion area recently reacquired from the NPS. Along with Walt Feurer Youth Pond (2 acres) and Catfish Pond (1 acre), two other small bodies of water also occur in the CAX and are characterized as shallow, warmwater ponds. All of the ponds and lakes are nontidal and freshwater. Portions of King and Queen creeks are also within the CAX boundary. Surface water resources at CAX are illustrated in Figure 2-6.

Surface waters at YFT comprise the waters of the West Branch of Wormley Creek (Figure 2-6). Most of the creek lies outside the fenced area and is fringed by a wooded border. A small portion of the creek along the eastern border of the site has been dammed to create a small freshwater impoundment. The remaining surface waters are tidally influenced.

Legend

- Installation Areas
- Wetlands & Waterbodies

Note: Wetland extents depicted were estimated by Geo-Marine, Inc. and Atlantic Division, NAVFAC (LANTDIV) in 2002 and provides the most accurate representation of the extent of wetland communities at WPNSTA available to date. These data are to be used for planning-level purposes and site-specific delineations may be required.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 2-5. Surface Water and Wetland Resources at WPNSTA.

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Prepared By: TETRA TECH

Date: 04/2010

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Legend

- Installation Areas
- Wetlands & Waterbodies

Note: Wetland extents depicted were estimated by Geo-Marine, Inc. and Atlantic Division, NAVFAC (LANTDIV) in 2002, as well as surveys performed by Tetra Tech, Inc. in 2009, and provides the most accurate representation of the extent of wetland communities at CAX available to date. Wetland extents depicted for YFT were estimated based on NWI data. These data are to be used for planning-level purposes and site-specific delineations may be required.

0 750 1,500 Feet

0 180 360 Meters

N

Figure 2-6. Surface Water and Wetland Resources at CAX and YFT.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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2.4.2 Watersheds

WPNSTA lies within the boundaries of two major watersheds, which are the York River basin to the north and the James River basin to the south. Approximately 75 percent of the WPNSTA is within the York River basin and 25 percent is in the James River basin. CAX and YFT are both located entirely within the York River basin. The York River and James River are major components of the Chesapeake Bay watershed and contribute more than half of the flow of water entering the Chesapeake Bay that originates from Virginia (van der Leeden 1993).

The land area at WPNSTA drains into eight separate catchment/basin areas (Figure 2-7). The largest, Felgates Creek, is the main drainage feature and drains more than 50 percent of the land area. King Creek drains about 15 percent of the land area. King Creek and Felgates Creek join at the mouth to empty into the York River. Blows Mill Run and Skiffes Creek drain approximately 20 percent of WPNSTA. These creeks drain off-Station into Skiffes Creek Reservoir, which is a Newport News Waterworks drinking supply reservoir. Indian Field Creek drains approximately 10 percent of WPNSTA. This drainage empties directly into the York River. The other four drainages, Roosevelt Pond, Ballard Creek, Baptist Run/Beaverdam Creek, and an unnamed drainage between Roosevelt Pond and Indian Field Creek, drain less than five percent each. Ballard Creek empties directly into the York River, and Baptist Run passes through CNHP on its way to Beaverdam Creek, which eventually empties into Newport News Reservoir, another Newport News Waterworks drinking water supply reservoir. Approximately 25 percent of the WPNSTA drains to drinking water supply reservoirs.

CAX has six catchment/basin areas (Figure 2-8). Cheatham Pond drains the western and northwestern areas of the Station, as well as the majority of the 786-acre CAX expansion parcel. The north and west areas of this parcel drain into one of two dammed impoundments or directly into Queen Creek. Penniman Lake and King Creek drain the central and southeastern portion of CAX, and a narrow strip along the northeast shoreline drains directly into the York River. The 406-acre Jones Millpond tract drains entirely into Jones Millpond. YFT drains almost entirely into the West Branch of Wormley Creek and a small impoundment at the eastern side of the terminal (Figure 2-8).

CAX
King Creek
Pond 11A
Pond 12
Pond 10
Pond 11
Felgates Creek
YORK RIVER
Indian Field Creek
WPNSTA
Roosevelt Pd
Lee Pd
Blow's Mill Run
Skiffe's Creek
1
2
3
4
5
6
7
8

Drainage Basins Key:
1. **Felgates Creek**
2. **King Creek**
3. **Skiffe's Creek**
4. **Baptist Run/Beaver Dam Creek**
5. **Ballard Creek**
6. **Roosevelt Pond**
7. **Unnamed Drainage Basin**
8. **Indian Field Creek**

Legend
- Installation Areas
- Drainage Basin Boundary
- 100 Year Floodplain

Source: INRMP 2004. FEMA Floodplain Data, accessed from: http://data.geocomm.com/ November 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 2-7. Watersheds and Floodplains at WPNSTA.

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Prepared By: TETRA TECH

Date: 04/2010

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Drainage Basins Key:
1. ***Wormley Creek**

***All of YFT drains into the West Branch of Wormley Creek.**

Legend

- Installation Areas
- Drainage Basin Boundary
- 100 Year Floodplain

Source: INRMP 2004. FEMA Floodplain Data, accessed from: http://data.geocomm.com/ November 2009.

Drainage Basins Key:
1. **York River**
2. **Penniman Lake**
3. **Cheatham Pond**
4. **King Creek**
5. **Jones Millpond**
6. **Queen & York River Split**

0 750 1,500 Feet

0 180 360 Meters

N

Figure 2-8. Watersheds and Floodplains at CAX and YFT.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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2.4.3 Floodplains

The Federal Emergency Management Agency (FEMA) flood insurance rate maps have been prepared for most of the region, including York County. One hundred-year flood elevations for the York River and its tributaries are established in FEMA maps and are used to identify potential flood-threats. A 100-year flood is a flood that has a one percent chance of being equaled or exceeded in any given year and is the standard used by federal agencies for floodplain management. Over 95 percent of the Station's facilities are located outside of the 100-year floodplain and are in little danger of flooding. Some roads and a few structures are located within areas with elevations (5 to 10 feet) that are prone to flood. Other facilities and roads are susceptible to intermittent inundation caused by surface water runoff during periods of heavy rain. The 100-year floodplains at WPNSTA are shown in Figure 2-7. Small portions of the shorelines of Queen Creek, King Creek, Cheatham Pond and Penniman Lake at CAX and West Branch of Wormley Creek at YFT are within the 100-year floodplain (Figure 2-8).

2.4.4 Wetlands

Wetlands maps were created in the mid-1990s for WPNSTA and CAX under a Memorandum of Understanding (MOU) between the USFWS and the DoN. National Wetlands Inventory (NWI) maps were produced largely from stereoscopic photo-interpretation of high altitude (1:24,000 scale) aerial photography and generally were not ground-truthed. In 2002, Geo-Marine, Inc. (GMI) and Atlantic Division, Naval Facilities Engineering Command (NAVFAC Atlantic) wetlands personnel conducted a more detailed wetlands inventory for WPNSTA and CAX using 1:12,000 scale color infrared (CIR) orthophotography flown in April 2002. Collateral wetlands information used in this more-detailed analyses included 1:6,000 scale true color aerial photography (also flown in April 2002), mid-1990s NWI data, United States Geological Survey (USGS) topographic maps (USGS 1984, USGS 1985), and WPNSTA and CAX soil survey data (Virginia Polytechnic Institute and State University 1982, USDA SCS 1985). The delineation was conducted in accordance with the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). A total of 856 acres were mapped as wetlands of various classifications at WPNSTA and 138 acres at CAX. More recent and detailed survey data were not available for the YFT; therefore, NWI data created in the mid-1990s for YFT were used to estimate the extent and classification of wetlands at this parcel. A total of 28 acres of wetlands is estimated to occur at YFT.

The 786-acre CAX expansion area acquired in 2004 was not included in the 2002 analysis. However, in the spring and fall of 2009, wetland scientists from Tetra Tech, Inc., performed ground-truthing and preliminary GPS survey of features identified on NWI maps and aerial photography for the entire expansion area. Additionally, any areas that were not identified by NWI data, but found to meet wetland criteria were also mapped. A total of 160 additional acres of wetlands were identified within the expansion area, resulting in a total of 298 acres of wetlands is estimated to occur at CAX.

Wetlands at the Station were classified according to the Cowardin classification of wetlands and deepwater habitats (Cowardin et al. 1979). The Cowardin classification identifies the following five major systems: marine (M), estuarine (E), riverine (R), lacustrine (L), and palustrine (P). Each system is further divided into a series of subsystems and classes were applicable. Those

wetlands identified at the Station are described in the following sections, summarized in Table 2-3, and presented in Figures 2-5 and 2-6.

Note that the extent and classifications presented within this INRMP are for planning purposes: all proposed construction and land-disturbing activities that have the potential to impact wetlands are reviewed by natural resources managers on an individual basis. A planning-level GIS layer of the current wetland delineation information is available to natural resource personnel and should be referenced when land use changes and development projects are proposed.

Estuarine. Estuarine wetlands are those that are periodically flooded with tidally influenced salty or brackish waters with salinity greater than 0.5 parts per thousand (ppt). Estuarine wetlands may be subtidal (E1) if the substrate is continuously submerged or intertidal (E2) if the substrate is exposed and flooded by tides. Tidal flooding occurs daily in the lower portions of the system and intermittently in the upper portions. Within the estuarine system, emergent marsh (E2EM1) and open water (E1UB) occur at WPNSTA and CAX. Estuarine wetlands include the following: King Creek, Felgates Creek, Indian Field Creek, and areas along the York River at WPNSTA; areas abutting Queen Creek, King Creek, and York River at CAX; and the West Branch of Wormley Creek at YFT.

Riverine. The riverine system includes natural or artificially created wetlands that are contained within a channel and are not dominated by persistent vegetation nor have salinity greater than 0.5 ppt. Riverine systems may be tidal (R1) if water velocity fluctuates under tidal influence; perennial (R2 or R3) if there is a constant flow of water throughout the year; or intermittent (R4) if the channel contains water for only part of the year. Most riverine wetlands at the WPNSTA and CAX are intermittent with streambeds of sand, cobble, or mud.

Lacustrine. The lacustrine system includes areas of open water that are greater than 20 acres or deeper than 6.6 feet at low water. Lacustrine waters may be tidal or nontidal, but must have salinity less than 0.5 ppt. Lacustrine wetlands lack trees, shrubs, and persistent emergent vegetation. Roosevelt Pond, Pond 11, and Pond 12 at WPNSTA and Jones Millpond, Penniman Lake, and Cheatham Pond at CAX were delineated as lacustrine wetlands.

Palustrine. Palustrine wetlands are nontidal vegetated wetlands or open water habitats less than 20 acres or 6.6 feet deep that have salinity less than 0.5 ppt. Palustrine wetlands at the Station include unconsolidated bottom (PUB), emergent (PEM), scrub-shrub (PSS), and forested (PFO). Several mixed categories also occur. With over 287 acres, the palustrine broad-leaved deciduous forest is the most abundant nonestuarine wetland type at the Station. Very few palustrine wetlands occur at YFT.

Table 2-3. Naval Weapons Station Yorktown Wetland Community Classifications.

NWI Code	Classification	
WPNSTA [1,2]		
E2EM1	Estuarine Intertidal Emergent Persistent	256.5
E1UB	Estuarine Subtidal Unconsolidated Bottom	207.3
L2UB	Lacustrine Littoral Unconsolidated Bottom	47.4
R4SB	Riverine Intermittent Streambed	NA
R2UB	Riverine Unconsolidated Bottom	NA
PEM2	Palustrine Emergent Nonpersistent	2.1
PEM1	Palustrine Emergent Persistent	32.4
PEM1/PSS1	Palustrine Emergent Persistent/Palustrine Scrub-Shrub Broad-Leaved Deciduous	2.8
PFO1	Palustrine Forested Broad-Leaved Deciduous	259.0
PFO1/4	Palustrine Forested Broad-Leaved Deciduous/Needle-Leaved Evergreen	3.4
PFO1/PEM1	Palustrine Forested Broad-Leaved Deciduous/Palustrine Emergent Persistent	3.6
PFO5	Palustrine Forested Dead	2.4
PFO5/1	Palustrine Forested Dead/Broad-Leaved Deciduous	1.6
PFO4	Palustrine Forested Needle-Leaved Evergreen	1.4
PSS1	Palustrine Scrub-Shrub Broad-Leaved Deciduous	10.8
PSS1/PEM1	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Palustrine Emergent Persistent	0.3
PSS1/PFO1	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Palustrine Forested Broad-Leaved Deciduous	0.3
PUB	Palustrine Unconsolidated Bottom	24.5
TOTAL		**855.9**
CAX (original parcel) [1,3]		
E2EM1	Estuarine Intertidal Emergent Persistent	22.0
E2SS3	Estuarine Intertidal Scrub-Shrub Broad-Leaved Evergreen	1.0
E2US	Estuarine Intertidal Unconsolidated Shore	9.2
L1UB	Lacustrine Limnetic Unconsolidated Bottom	47.7
L2EM2	Lacustrine Littoral Emergent Nonpersistent	1.0
L2UB	Lacustrine Littoral Unconsolidated Bottom	45.4
R4SB	Riverine Intermittent Streambed	NA
R2UB	Riverine Unconsolidated Bottom	NA
PEM2	Palustrine Emergent Nonpersistent	0.5
PEM1	Palustrine Emergent Persistent	0.4
PFO1	Palustrine Forested Broad-Leaved Deciduous	8.9
PSS1/3	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Broad-Leaved Evergreen	1.0
PUB	Palustrine Unconsolidated Bottom	1.2
Subtotal		**138.3**
CAX (expansion parcel) [1,3]		
E1UB	Estuarine Intertidal Emergent Persistent	11.2
E2EM1	Estuarine Subtidal Unconsolidated Bottom	31.0
L1UB	Lacustrine Limnetic Unconsolidated Bottom	90.9
R4SB	Riverine Intermittent Streambed	NA
R2UB	Riverine Unconsolidated Bottom	NA
PEM1	Palustrine Emergent Persistent	1.9
PFO1	Palustrine Forested Broad-Leaved Deciduous	18.6
PSS1	Palustrine Scrub-Shrub Broad-Leaved Deciduous	2.9
PUB	Palustrine Unconsolidated Bottom Deciduous	3.6
Subtotal		**160.1**
TOTAL		**298.4**

YFT [1,4]		
E1UB	Estuarine Intertidal Emergent Persistent	20.8
E2EM1	Estuarine Subtidal Unconsolidated Bottom	0.8
E2SS1	Estuarine Intertidal Scrub-Shrub Broad-Leaved Deciduous	0.6
E2US	Estuarine Intertidal Unconsolidated Shore	3.8
PEM1	Palustrine Emergent Persistent	0.3
PUB	Palustrine Unconsolidated Bottom Deciduous	2.1
TOTAL		**28.3**

[1] These delineations and classifications are for planning purposes only; all proposed construction and land-disturbing activities that have the potential to impact wetlands are reviewed by natural resources managers on an individual basis.
[2] WPNSTA and CAX (original parcel) wetland extents/classifications listed here were estimated by Geo-Marine, Inc. (GMI) and NAVFAC Atlantic in 2002 and are the most accurate representation of the extent and classification of wetland communities at WPNSTA and CAX (original parcel) available to date.
[3] CAX (expansion parcel) wetland extents/classifications listed here were estimated by Tetra Tech, Inc., in 2009 and is the most accurate representation of the extent and classification of wetland communities at CAX (expansion parcel) available to date.
[4] YFT wetland extents/classifications listed here were derived from USFWS NWI data from the mid-1990s and are the most accurate representation of the extent and classification of wetland communities at YFT available to date.

2.5 Ecological Community Groups

Ecological communities in Virginia are classified and ranked using the second approximation (version 2.2) of a natural community classification system developed by the ecologists at VDCR-DNH (Fleming et al. 2006). This classification system is part of the International Classification of Ecological Communities (Grossman et al. 1998 *in* NatureServe 2009), which provides a framework for classification and conservation ranking of ecological communities occurring throughout the United States, Canada, and Latin America. The following VDCR-DNH ecological community groups have been identified to occur at the Station:

- Basic Mesic Forest
- Coastal Plain/Piedmont Basic Seepage Swamps
- Coastal Plain Depression Wetlands
- Coastal Plain Dry Calcareous Forests and Woodlands
- Mixed Mesic Hardwood Forests
- Oak/Heath Forests
- Coastal Plain/Piedmont Floodplain Forests
- Coastal Plain/Piedmont Swamp Forests
- Coastal Plain/Piedmont Acidic Seepage Swamps
- Semipermanent Impoundments
- Tidal Freshwater Marshes
- Tidal Mesohaline and Polyhaline Marshes
- Tidal Shrub Swamps

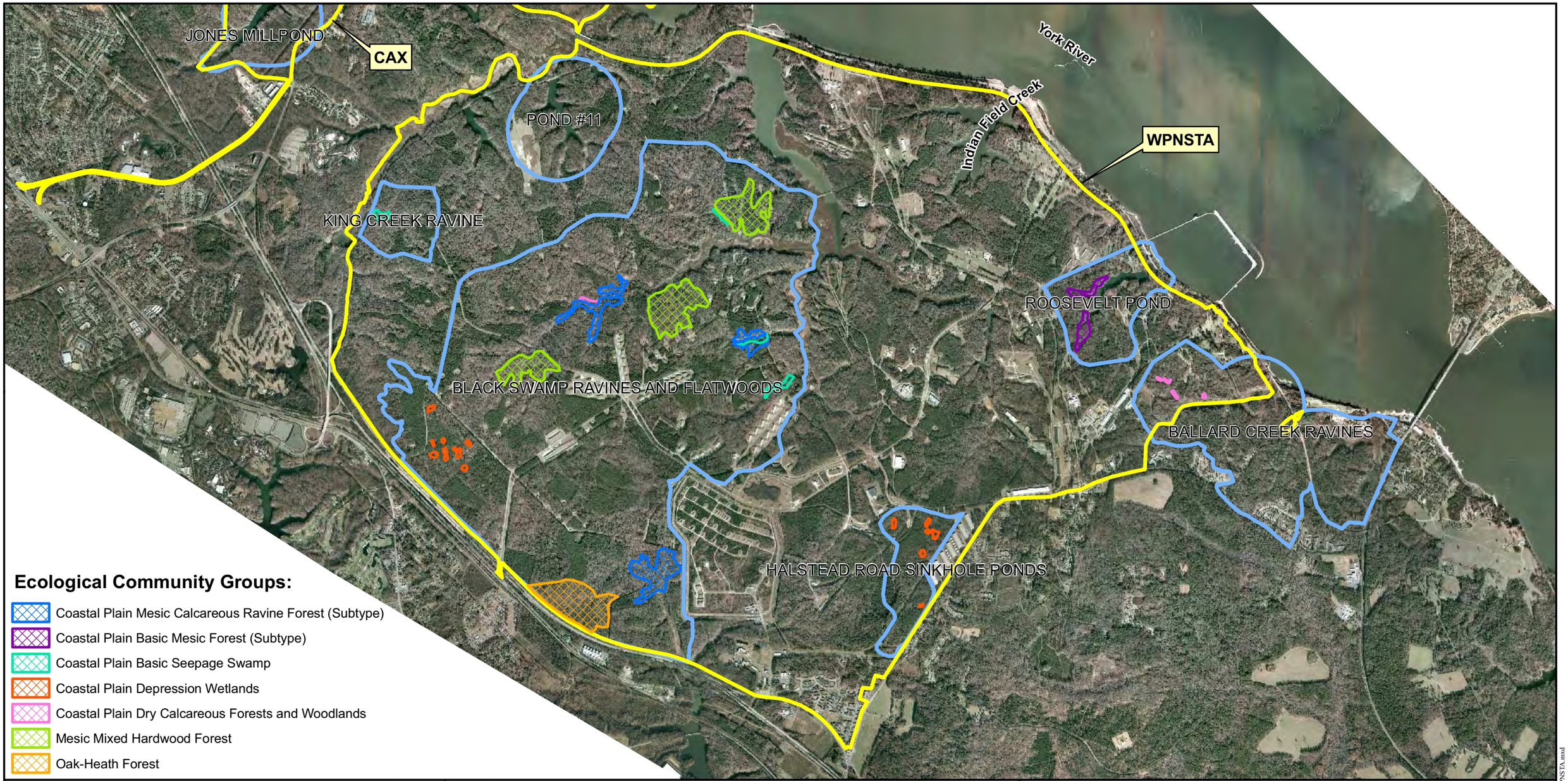
Natural ecological communities described by VDCR-DNH do not include planted or artificially maintained communities such as pine plantations, maintained open areas, urban forests, and landscaped areas. However, these communities comprise a significant portion of the Station and are also included in this discussion. Although a comprehensive Station-wide survey and delineation of these communities has not occurred several exemplary and rare community groups have been mapped at the Station through significant efforts in 2003 (Van Alstine et al. 2003) and 2009 (Tetra Tech 2009). These areas are depicted in Figures 2-9 and 2-10 and discussed further in Section 2.8.

2.5.1 Basic Mesic Forest

Basic Mesic Forest are mixed hardwood forests that typically occur on sheltered north- to east-facing slopes and steep ravines that have eroded down to shell marl deposits of the Yorktown Formation. The dominant overstory species are American beech (*Fagus grandifolia*), southern sugar maple (*Acer barbatum*), chinkapin oak (*Quercus muehlenbergii*), red oak (*Quercus rubra*), and tulip poplar (*Liriodendron tulipifera*). Less common trees can include bitternut hickory (*Carya cordiformis*) and black walnut (*Juglans nigra*). Slippery elm (*Ulmus rubra*), American holly (*Ilex opaca*), and paw-paw (*Asimina triloba*) are characteristic understory species. Typical herbaceous species include Christmas fern (*Polystichum acrosticoides*), golden ragwort (*Senecio aureus*), round-lobed hepatica (*Hepatica americana*), black cohosh (*Cimicifuga racemosa*), bloodroot (*Sanguinaria canadensis*), and cutleaf toothwort (*Cardamine concatenata*). Several herbaceous species that are rare in the state can also occur in this community. These include the Florida adder's mouth (*Malaxis spicata*) and the hairy shadow-witch orchid (*Ponthieva racemosa*), which are on the Virginia Vascular Plant Watchlist (Townsend 2009).

2.5.2 Coastal Plain/Piedmont Basic Seepage Swamps

Coastal Plain/Piedmont Basic Seepage Swamps are deciduous forested wetlands that occur in small, saturated stream bottoms in ravines that have downcut into Tertiary shell deposits or limesands. A braided drainage, with hummock-and-hollow microtopography, is characteristic. Soils have very high calcium and base saturation levels. Green ash *(Fraxinus pennsylvanica*) and red maple *(Acer rubrum*) are the two dominant overstory trees, which form a closed canopy. Typical shrubs are stiff dogwood (*Cornus foemina*), spicebush (*Lindera benzoin*), and wax myrtle (*Morella cerifera*). Common herbs on the better-drained hummocks include golden ragwort, drooping bulrush (*Scirpus lineatus*), and brome sedge (*Carex bromoides*). Mucky hollows and seepage rills support abundant lizard's tail (*Saururus cernuus*), smooth beggartick (*Bidens laevis*), blackfruit clearweed (*Pilea fontana*), fowl mannagrass (*Glyceria striata*), and jewelweed (*Impatiens capensis*). A number of disjunct calciphiles including marsh marigold (*Caltha palustris*) and shadow-witch orchid occur.



Legend

- Installation Areas
- Ecological Areas

Source: Van Alstine et al., 2003, U.S. Navy 2009, VDCR 2010.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 2-9. Ecological Community Groups and Ecological Areas at WPNSTA.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 09/2010

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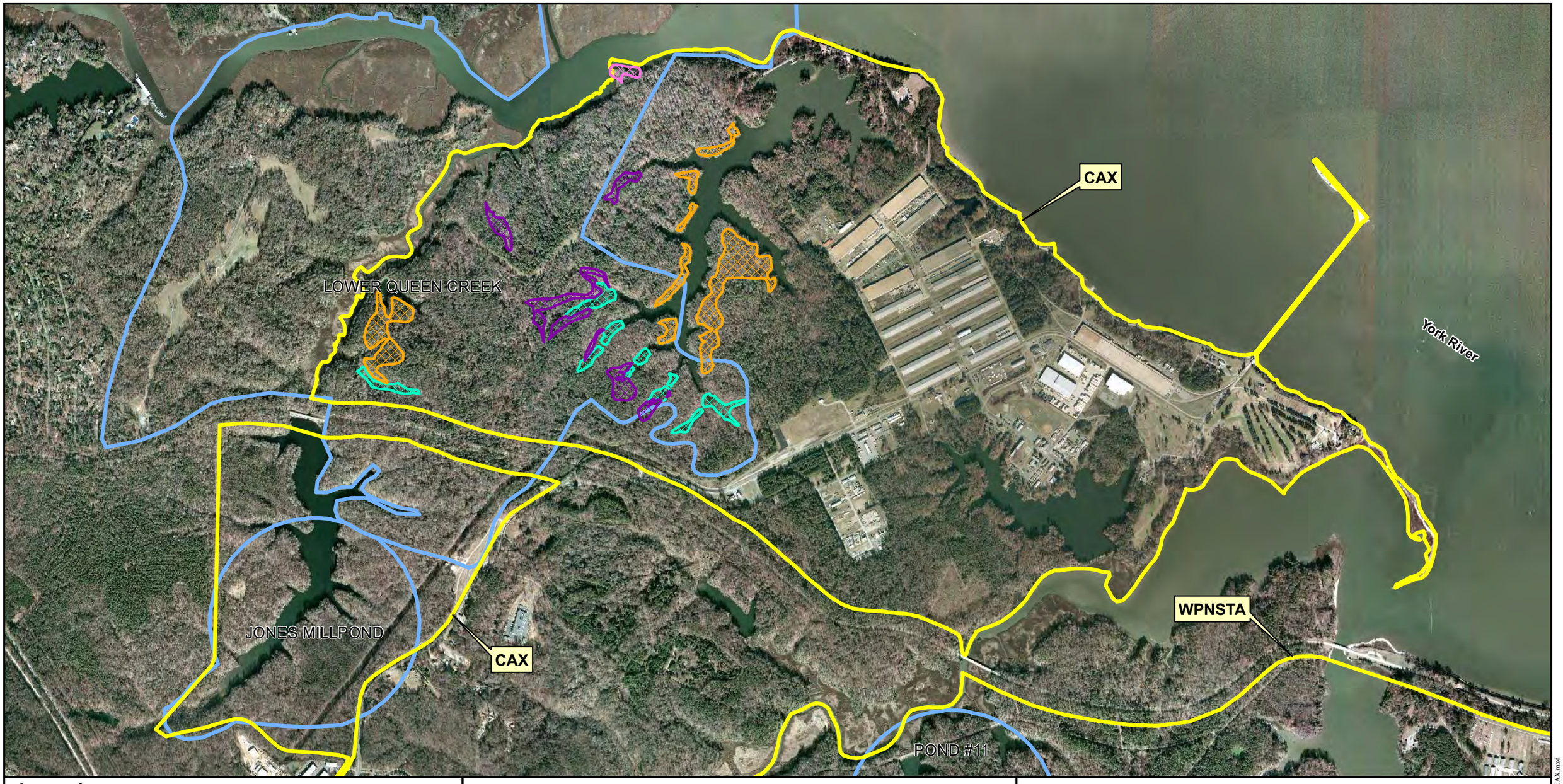

Legend

- Installation Areas
- Ecological Areas

Ecological Community Groups:

- Coastal Plain Basic Mesic Forest (Subtype)
- Coastal Plain Basic Seepage Swamps
- Coastal Plain Dry Calcareous Forests and Woodlands
- Oak/Heath Forests

Source: Van Alstine et al., 2003, Tetra Tech 2009, U.S. Navy 2009, VDCR 2010.

0 750 1,500 Feet

0 180 360 Meters

N

Figure 2-10. Ecological Community Groups and Ecological Areas at CAX.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 09/2010

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2.5.3 Coastal Plain Depression Wetlands

Coastal Plain Depression Wetlands are seasonally flooded basin wetlands of flat Coastal Plain uplands with fluctuating, seasonally perched water tables. The Coastal Plain Depression Wetlands commonly referred to as "sinkhole ponds" are thought to have formed geologically through the dissolution of underlying shell marl deposits. Soils and water chemistry at these sites are not influenced by the underlying marl and are strongly acidic. Wetland vegetation varies from site to site according to the depth and duration of flooding and ranges from forested, to herbaceous, to nearly absent. Typical trees occurring in wooded ponds are red maple, sweetgum (*Liquidambar styraciflu*a), black gum (*Nyssa sylvatica*), willow oak *(Quercus phellos*), and overcup oak (*Quercus lyrata*). Shrubs that occur include buttonbush *(Cephalanthus occidentali*s), swamp loosestrife *(Decodon verticillatu*s) and fetterbush *(Leucothoe racemos*a). Examples of characteristic herbs are glaucous sedge *(Carex glaucescen*s), cypress-swamp sedge *(Carex joori*i), pocosin sedge *(Carex striata*), long-tubercled spikerush *(Eleocharis tuberculosa*), eastern narrowleaf seedbox *(Ludwigia linearis*), globe-fruited seedbox *(Ludwigia sphaerocarpa*), tall flat panic grass *(Panicum rigidulum*), warty panic grass *(Panicum verrucosum*), and woolgrass *(Scirpus cyperinus*).

2.5.4 Coastal Plain Dry Calcareous Forests and Woodlands

Coastal Plain Dry Calcareous Forests (canopy cover typically greater than 60 percent) and Woodlands (canopy cover typically 5 to 60 percent) are rare and localized communities of deciduous or occasionally mixed forests and woodlands. Soils are fertile and neutral to slightly alkaline, with high calcium levels. This ecological group occurs on steep, convex, south-facing slopes of deep ravines and stream-fronting bluffs that have downcut into Tertiary shell deposits and limesands. Canopies range from semi-closed to very open. Chinkapin oak is the most characteristic tree and southern sugar maple, white oak (*Quercus alba*), northern red oak (*Quercus rubra*), bitternut hickory, American beech, and white ash *(Fraxinus americana*) are common associates. The understory includes eastern red cedar *(Juniperus virginiana*) and eastern redbud *(Cercis canadensis*). The herbaceous layer is patchy but diverse. Robin's-plantain (*Erigeron pulchellus*) and Bosc's panic grass (*Dichanthelium boscii*), American bellflower (*Campanulastrum americanum*), lopseed (*Phryma leptostachya*), Virginia snakeroot (*Aristolochia serpentaria*), and crested coralroot (*Hexalectris spicata*) are characteristic herbaceous species. White crownbeard *(Verbesina virginica* var. *virginic*a) is a disjunct species that is often associated with these communities. Compared to Basic Mesic Forests of the Coastal Plain, these dry calcareous forests have a larger component of oaks (particularly chinkapin oak) in the overstory and have a much less lush herb layer.

2.5.5 Mesic Mixed Hardwood Forests

Mesic Mixed Hardwood Forests occur on level ridgetops, mesic uplands, and lower slopes on acidic, relatively poor soils. This forest type has a closed canopy dominated by American beech, red or white oak, and tulip poplar. Lesser amounts of red maple and hickories (*Carya* spp.) also occur. Understory composition is characterized by American holly, flowering dogwood (*Cornus florida*), American hornbeam (*Carpinus caroliniana*), and, on some sites, paw-paw. The

herbaceous layer is generally sparse to absent, but patches of Christmas fern may occur. Dense patches of muscadine grape (*Vitis rotundifolia*) may also occur. This forest type is commonly referred to as "southern mixed hardwood forest" and is a common community at the Station.

2.5.6 Oak/Heath Forests

Oak/Heath Forests are oak-dominated forests on upland sites with well-drained to excessively well-drained, infertile soils. The soils are acidic with high levels of iron. These forests often occur on sandy, gravelly, or stony slopes and level uplands. Thick accumulations of duff and a dense cover of inflammable shrubs (heaths) make these forests susceptible to periodic fire, which favors oak recruitment. Mixed oaks, including white oak, black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), southern red oak (*Quercus falcata*), chestnut oak (*Quercus prinus*), and post oak (*Quercus stellata*) dominate the forest canopy. Loblolly pine (*Pinus taeda*) and Virginia pine (*Pinus virginiana*) are common associates that usually indicate past disturbance. Red maple, black gum, and sourwood (*Oxydendrum arboreum*) may occur in the canopy or understory. Hickories are rare in the canopy, which helps distinguish this ecological group from the Acidic Oak-Hickory Forests group. The understory is characterized by small trees including American holly, flowering dogwood, and sassafras (*Sassafras albidum*). A number of ericaceous species including mountain laurel (*Kalmia latifolia*), black huckleberry (*Gaylussacia baccata*), dangleberry (*Gaylussacia frondosa*), blueberries (especially *Vaccinium stamineum* and *Vaccinium pallidum*) form dense shrub and herbaceous layers. Herbaceous species are rare in this forest type.

2.5.7 Coastal Plain/Piedmont Floodplain Forests

This is a diverse group of temporarily flooded forests occupying well-drained bottomlands of the Coastal Plain and outer Piedmont, often in association with Coastal Plain/Piedmont Swamp Forests. Species composition varies greatly with stream order, soil type, flooding regime, and successional status. Well-drained floodplains with some microtopographic heterogeneity support swamp chestnut oak (*Quercus michauxii*), cherrybark oak (*Quercus pagoda*), laurel oak (*Quercus laurifolia*), sugarberry (*Celtis laevigata*), and sweetgum. On exceptionally well-drained small stream bottoms, tulip poplar is often important. Small tree, shrub, and herbaceous composition is highly variable with geography and site conditions.

2.5.8 Coastal Plain/Piedmont Swamp Forests

A group of seasonally and semipermanently flooded forests is included in this ecological group, which occurs on bottomland sites of the Coastal Plain and Piedmont that are not occupied by the Bald Cypress-Tupelo Forests community group. Characteristic tree species vary with habitat conditions. Combinations of green ash, red maple, sweetgum, and willow oak usually dominate seasonally flooded swamps. Swamp cottonwood (*Populus heterophylla*) is characteristic of this group and often becomes dominant in systems recently subject to disturbance. Shrub species commonly present include American hornbeam (*Carpinus caroliniana*), arrowwoods (*Viburnum dentatum* and *V. recognitum*), maleberry (*Lyonia ligustrina*), and swamp rose (*Rosa palustris*). On small stream bottoms, where alluvial landforms and habitat conditions occur at very small scales, trees typical of both levees and swamps may occur in mixed stands.

2.5.9 Coastal Plain/Piedmont Acidic Seepage Swamps

Coastal Plain/Piedmont Seepage Swamps are saturated deciduous or mixed forested wetlands that occur at the stream bottom of small headwaters and toe slopes with abundant groundwater seepage. The soils are nutrient poor and acidic. These habitats generally consist of braided stream channels, sphagnum-covered hummocks, and mucky depressions. The overstory is dominated by red maple and black gum with tulip poplar and loblolly pine occurring as lesser associates. Common small trees and shrubs are sweetbay magnolia (*Magnolia virginiana*), sweet pepperbush, highbush blueberry (*Vaccinium corymbosum*), spicebush, and possum-haw (*Viburnum nudum*). Much of the herbaceous layer consists of cinnamon fern (*Osmunda cinnamomea*), skunk cabbage (*Symplocarpus foetidus*), and netted chain fern (*Woodwardia areolata*). The skunk cabbage and several other herbaceous species including kidneyleaf grass-of-parnassus (*Parnasssia asarifolia*), twining bartonia (*Bartonia paniculata*), and the federally listed swamp-pink (*Helonias bullata*) may be considered diagnostic of this ecological group.

2.5.10 Semipermanent Impoundments

Semipermanent Impoundments encompass areas of aquatic and shoreline vegetation of both beaver ponds and long-established artificial ponds along streams. Community composition varies greatly with substrate and water depth. Dominant species of such marshes include smartweeds *(Polygonum* spp.), pickerelweed *(Pontederia cordata*), arrow-arum *(Peltandra virginica*), common rush *(Juncus effusus*), three-way sedge *(Dulichium arundinaceum*), tussock sedge *(Carex stricta*), spikerushes *(Eleocharis* spp.), coastal mannagrass *(Glyceria obtusa*), marsh St. John's-wort *(Triadenum virginicu*m), and eastern rose-mallow *(Hibiscus moscheutos*). In deepwater impoundments, floating and submerged aquatic plants, especially American water lily *(Nymphaea odorata*) and bladderworts *(Utricularia* spp.), are typical. This community type is equivalent to nontidal palustrine emergent wetlands in the Cowardin classification system.

2.5.11 Tidal Freshwater Marshes

Tidal Freshwater Marshes are regularly flooded marshes that lie along the upper reaches of Coastal Plain rivers and tributaries. Freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal waters has less influence than freshwater from upstream. Freshwater conditions generally occur in these systems, though influxes of saltwater may occur during spring tides or periods of unusually low rainfall. The most common species are arrow-arum, dotted smartweed (*Polygonum punctatum*), wild rice (*Zizania aquatica*), pickerelweed, rice cutgrass (*Leersia oryzoides*), tearthumbs (*Polygonum arifolium* and *Polygonum.sagitatum*), and beggarticks. Species diversity and structure vary with salinity, duration of inundation, and disturbance. Mudflats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (*Nuphar advena*), and marshes that are on higher elevations in freshwater regimes are more diverse. This community includes the tidally influenced palustrine wetlands.

2.5.12 Tidal Mesohaline and Polyhaline Marshes

Both Tidal Mesohaline and Polyhaline Marshes occur in narrow fringes along tidal rivers in the inner Coastal Plain. They are characterized by very low species diversity and low plant stature.

Mesohaline Salt Marshes occur in lower, more regularly flooded tidal areas and have salt concentrations between 5 and 18 ppt. Taller marsh dominated by saltmarsh cordgrass, often with saltgrass or saltmarsh bulrush *(Schoenoplectus robustus*), is characteristic.

Polyhaline Salt Marshes occur on higher elevations and are saturated for shorter periods resulting in higher concentrations of salt (from 18 to 30 ppt). Salt meadows dominated by saltgrass and saltmeadow cordgrass generally occur in these situations. Salt meadows occasionally have a moderately diverse assemblage of associates, including black grass rush *(Juncus gerardii* var. *gerardii*), woody glasswort *(Sarcocornia perennis*), sea-oxeye *(Borrichia frutescens*), sea-lavender *(Limonium carolinianum*), glassworts (*Salicornia virginica* and *Salicornia bigelovii*), sea rose-pink *(Sabatia stellaris*), salt-marsh false foxglove *(Agalinis maritima*), and narrow-leaved loosestrife *(Lythrum lineare*).

Another common community type is strongly dominated by black needlerush *(Juncus roemerianus*), which often forms extensive stands. The abundance of this species, which also occurs in oligohaline marshes, may have increased as a result of contemporary reductions in fire frequency in salt marshes. All of the estuarine marshes at the Station are included in these communities.

2.5.13 Tidal Shrub Swamps

Tidal Shrub Swamps of freshwater to oligohaline rivers and embayments frequently occur in fringes between emergent tidal wetlands and swamp forests or uplands. They also occur on depositional islands in large meanders of tidal rivers. Several compositional variants have been documented, including the following five types: (1) buttonbush *(Cephalanthus occidentalis*)-dominated shrublands of tidal freshwater systems; (2) swamp rose *(Rosa palustris*)-dominated shrublands of tidal freshwater systems; (3) black willow *(Salix nigra*)-dominated shrublands of tidal freshwater systems; (4) smooth alder *(Alnus serrulata*)-dominated shrublands of tidal oligohaline systems; and (5) southern bayberry and/or Carolina willow *(Salix caroliniana*)-dominated shrublands of lunar-tidal and wind-tidal oligohaline systems. The herbaceous flora associated with these communities is very diverse and typically contains species characteristic of both tidal marshes and swamp forests. This community type includes the tidally influenced palustrine scrub-shrub wetlands.

2.5.14 Pine Plantations

Though not included in the VDCR-DNH ecological community classification, naturally occurring or planted pine stands comprise an important ecological community at WPNSTA and CAX and are included here as a community group. Pine and pine-dominated stands occur on ridges and relatively level portions of the Station that were previously farmed. Loblolly pine is the dominant species in the Station's pine plantations, though Virginia pine can be a lesser associate. In stands where hardwood competition has not been controlled, oaks and other hardwoods can also become important associates or codominant overstory species. Dense, even-age pine stands have low species diversity and have little or no understory, shrub layer, or herbaceous layer. More species and structural diversity exist where stand thinning has occurred or trees were planted with wide spacing.

2.5.15 Maintained Open Areas

Areas that are infrequently mowed or otherwise maintained are classified as maintained open areas. Such areas increase habitat diversity on the Station by creating early successional habitat, which benefits a large number of wildlife species. These communities primarily include an extensive area of grasslands associated with abandoned operational areas, but also include strips of previously mowed road shoulder that are no longer maintained. Periodic mowing in the grassland areas is conducted to prevent the invasion of woody species. Wildlife food plots are also included in this community group, though they are generally maintained through tilling and seeding. A number of the sites are restored demolition sites on which buildings or other types of abandoned infrastructure have been removed. Demolition sites that are still regularly mowed are not included in this group.

A large number of grasses, forbs, shrubs, and tree seedlings occur in maintained open areas. Species composition varies with site condition, treatment during reclamation, and maintenance regime.

2.5.16 Urban Forests and Landscaped Areas

Urban vegetative communities mapped and described include areas with significant infrastructure such as roads, railroad tracks, buildings, or magazines that are frequently mowed or otherwise maintained. Lawns, landscaped areas, street trees, ball fields, and other frequently mowed open areas associated with the infrastructure are included in this community group.

2.6 Fauna

The diversity of habitats at the Station provides food and cover for a wide variety of wildlife species. Faunal surveys, including Buhlmann et al. (1990), Buhlmann and Ludwig (1992), Galvez and. Swihart (1999), GMI (2002), and Tetra Tech, Inc. (2009) have identified a large number of mammals, reptiles and amphibians (herpetofauna), fish, and birds on the Station. Lists of those species known to occur on the Station is provided in Appendix C and summarized in the following sections.

2.6.1 Mammals

The most common large mammals known to occur include white-tailed deer, coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes vulpes*). The coyote population is considered to be heavy by natural resource staff and the black bear (*Ursus americanus*) (Wilson 2002) and bobcat are becoming more common in the region and have been documented as occurring at the Station. Raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginianus*), eastern cottontail (*Sylvilagus floridana*), eastern gray squirrel (*Sciurus carolinensis*), American beaver (*Castor canadensis*), woodchuck (*Marmota monax*), and muskrat (*Ondatra zibethicus*) are common mid-sized mammals. Numerous small mammals, including southern flying squirrel (*Glaucomys volans*), rice rat (*Oryzomis palustris*), Norway rat (*Rattus norvegicus*), white-footed mouse (*Peromyscus leucopus*), house mouse (*Mus musculus*), meadow vole (*Microtus pennsylvanicus*), pine vole (*Microtus pinetorum*), eastern mole (*Scalopus*

aquaticus), southern short-tailed shrew (*Blarina carolinensis*), southeastern shrew (*Sorex longirostris*), and least shrew (*Cryptotis parva*) also occur.

2.6.2 Herpetofauna

A variety of reptiles and amphibians is known to inhabit the area. The most common snakes include the northern watersnake (*Nerodia sipedon sipedon*), black rat snake (*Elaphe obsoleta*), northern black racer (*Coluber constrictor constrictor*), and rough green snake (*Opheodrys aestivus*). The copperhead (*Agkistrodon contortix*) is the only species of venomous snake known to occur on the Station, though eastern cottonmouth (*Agkistrodon piscivorus piscivorus*) and canebrake rattlesnake (*Crotalus horridus* [Coastal Plain population]) have known populations in York County. Common turtles include the eastern snapping turtle (*Chelydra serpentina serpentina*), northern red-bellied turtle (*Pseudemys rubriventris*), eastern mud turtle (*Kinosternon subrubrum subrubrum*), and eastern box turtle (*Terrapene carolina carolina*). Lizards found on the Station include the little brown skink (*Scincella lateralis*) and the common five-lined skink (*Plestidon fasciatus*). Of the amphibians that inhabit the area, frogs and toads comprise the largest group. Common frogs and toads found on the Station include the northern green frog (*Lithobates clamitans melanota*), southern leopard frog (*Lithobates sphenocephala utricularius*), northern spring peeper (*Pseudacris crucifer crucifer*), green tree frog (*Hyla cinerea*), upland chorus frog (*Pseudacris triseriata*), and eastern American toad (*Anaxyrus americanus americanus*). Salamanders include spotted salamander (*Ambystoma maculatum*), marbled salamander (*Ambystoma opacum*), red-spotted newt (*Notophthalmus viridescens viridescens*), and the state-listed Mabee's salamander (*Ambystoma mabeei*).

2.6.3 Fish

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

The York River system supports anadromous fish species. For instance, American shad (*Alosa sapidissima*) and striped bass spawn in the spring and use the fresh and brackish shoreline as nursery areas (Hewitt et al.2010). In addition, potential spawning habitats of Atlantic sturgeon *(Acipenser oxyrhynchus oxyrhynchus)*, are located in the upper limits of saltwater intrusion, approximately 18 miles northwest of the installation, in the Mattaponi and Pamunkey rivers (Hewitt et al. 2010).

Freshwater fish habitat at the installations is restricted to man made lakes and ponds and streams. No surveys of the streams have been conducted. The lakes and ponds support several species of

fish that were either intentionally stocked or were released there by fishermen. Stocked species include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), pumpkinseed sunfish (*Lepomis gibbosus*), black crappies (*Pomoxis nigromaculatus*), and redear sunfish (*Lepomis microlophus*). Other species collected during fisheries surveys (Galvez and Swihart 1999, Swihart and Daniel 1994, USFWS 2002b) include golden shiner (*Notemigonus crysoleucas*), American eel (*Anguilla rostrata*), mudminnow (*Umbra limi*), and bluespotted sunfish (*Enneacanthus gloriosus*).

2.6.4 Birds

Bird species at WPNSTA and CAX include a mix of species that utilize forests, edges, open fields, urban areas, and wetlands. Nearly 100 species were recorded during surveys at WPNSTA (Buhlmann and Ludwig 1992, GMI 2002), and almost 300 bird species have been recorded on CAX by the Williamsburg Bird Club (U.S. Navy 1999b). Surveys were conducted by wildlife biologists from Tetra Tech in May and October of 2009 on the 786-acre CAX expansion area. Surveys included 23 fixed point counts across four survey days and any incidental auditory or visual observations regardless of position in the parcel. The May field effort focused on breeding birds, and the October effort focused on migratory birds, waterfowl, and overwintering individuals. Appendix C includes a list of birds that are known to occur at the Station based on these studies and surveys, excluding the Williamsburg Bird Club data. Scientific names are included in Appendix C for reference.

Forested areas at WPNSTA and CAX serve as important stopover grounds for migrating neotropical species. The large areas of contiguous forest make the Station particularly attractive. Forest-dwelling birds that have been observed include the brown thrasher, wood thrush, ovenbird, Black and white warbler, pine warbler, red-eyed vireo, white-eyed vireo, common yellowthroat, scarlet tanager, summer tanager, and various woodpeckers. Several of the more common large birds that breed in forest habitats are the red-shouldered hawk, sharp-shinned hawk, barred owl, and screech owl.

A large percentage of land at WPNSTA and CAX is comprised of maintained open areas. These habitats and the edges between the fields and forests are utilized by a number of migratory species and year-round residents. Several of the common birds that use these habitats are the Eastern bluebird, Northern mockingbird, American robin, brown-headed cowbird, mourning dove, Killdeer, American kestrel, and red-tailed hawk.

Wetlands and open water habitats at the Station commonly attract a variety of wading birds and waterfowl, including great blue and green-backed herons, great egrets, wood ducks, mallards, mute Swans, tundra swans, and Canada Geese. A few of the aquatic birds seen include double-crested cormorant, common goldeneye, brown pelican, and a variety of gulls.

Familiar birds of urban settings, some of which can be considered pests, include house sparrows, house finches, rock doves (pigeons), mourning doves, purple martins, chimney swifts, European starlings, and common nighthawks.

2.7 Rare, Threatened, & Endangered Species & Significant Natural Communities

Inventories of rare, threatened, and endangered species and significant natural communities have been conducted at the Station through cooperative agreements between NAVFAC Atlantic and the VDCR-DNH (Buhlmann et al. 1990, Buhlmann and Ludwig 1992, Van Alstine et al. 2003). To date, inventories at the Station have documented two state-listed species, the bald eagle and Mabee's salamander; one rare moth (*Sphinx franckii*); and three rare plants, the bog twayblade (*Liparis loeselii*), southern beach spurge (*Chamaesyce bombensis*) and mountain camellia (*Stewartia ovata*) (Table 2-4). The bald eagle has recently been removed from the Federal endangered species list, although it continues to be listed as a Federal species of concern, a state-listed threatened species, and is afforded protection under the Bald Eagle and Golden Eagle Protection Act. Inventories conducted in 2002 and 2003 reconfirmed the occurrence of a bald eagle nest site at WPNSTA and identified new nest sites at WPNSTA and CAX. One adult state-listed threatened Mabee's salamander was found in the same seasonal pond at WPNSTA during a 2007 survey effort as it was in 1990 and 1991 (Petersen 2007). At CAX two rare plants, the bog twayblade and southern beach spurge have been documented. The bog twayblade was last observed 1997 and the southern beach spurge has not been observed since 1975 (Table 2-4). In addition, an individual state-rare moth, Franck's sphinx, was captured in the area of Jones Millpond in 2002. This is only the second confirmed record of this species for the state of Virginia.

Table 2-4. Known Rare, Threatened, and Endangered Species at Naval Weapons Station Yorktown.

Scientific Name	Common Name	Installation	Global Rarity Rank	State Rarity Rank	Federal Status	State Status	Last Observed
Haliaeetus leucophalus	Bald Eagle	WPNSTA/ CAX	G4	S2S3B/ S3N	SOC	LT	2009
Ambystoma mabeei	Mabee's salamander	WPNSTA	G4	S1/S2	-	LT	2007
Chamaesyce bombensis	Southern beach spurge	CAX	G4G5	S2	-	-	1975
Liparis loeselii	Bog twayblade	CAX	G5	S2	-	-	1997
Stewartia ovata	Mountain camellia	CAX	G4	S2	-	-	1989
Sphinx franckii	Franck's sphinx	CAX	G4	S1/S3	-	-	2002

S1 = Extremely rare
S2 = Very rare
S3 = Rare to uncommon
S_B = Breeding status
S_N = Nonbreeding status
G4 = Apparently secure
G5 = Secure
LT = Listed threatened
LE = Listed endangered
SOC = Species of Concern
Source: Van Alstine et al. 2003

In addition to rare species inventories, the 2002 VDCR-DNH inventory (Van Alstine et al., 2003), as well as an inventory of the CAX expansion area in 2009 (Tetra Tech 2009), included a survey of significant ecological communities at the Station. For the purposes of these surveys, and as define by Van Alstine et al. 2003, significant ecological communities inventoried represent outstanding examples of common ecological communities or examples of rare ecological communities as indicated by their global conservation rank. Seven significant natural communities were documented at the WPNSTA and CAX (Figures 2-9 and 2-10). Of these seven, three would likely be considered exemplary having characteristics that generally define the community as described within Fleming et al. 2006, but occurrences are generally secure. The remaining four would be considered rare based upon their global conservation rank (i.e., G3 or lower). Basic Mesic Forests (Coastal Plain Basic Mesic Forest subtype), Oak/Heath Forests (Coastal Plain Mixed Oak/Heath Forest subtype), and Mesic Mixed Hardwood Forests (Northern Coastal Plain Mesic Mixed Hardwood Forest subtype) are considered exemplary, whereas Basic Mesic Forests (Coastal Plain Mesic Calcareous Ravine Forest subtype), Coastal Plain/Piedmont Basic Seepage Swamps (Coastal Plain Calcareous Seepage Swamp subtype), Coastal Plain Depression Wetlands, and Coastal Plain Dry Calcareous Forests and Woodlands (Coastal Plain Dry Calcareous Slope Forest subtype) would be considered rare. The seven communities/subtypes and their state and global rarity rank are listed in Table 2-5 (see Section 2.5 for community descriptions).

Van Alstine et al. 2003 continues to provide the best resource for the history of occurrence and documentation of past surveys at the Station in regards to rare, threatened, and endangered species, and significant natural communities and ecological/conservation areas (see Section 2.8)

Table 2-5. Significant Ecological Communities at Naval Weapons Station Yorktown.

Community Group	Community Type or Subtype	Global Rarity Rank	State Rarity Rank
Basic Mesic Forests	Coastal Plain Mesic Calcareous Ravine Forest	G2?	S2
Basic Mesic Forests	Coastal Plain Basic Mesic Forest	G4?	S3
Coastal Plain/Piedmont Basic Seepage Swamps	Coastal Plain Calcareous Seepage Swamp	G2	S2
Coastal Plain Depression Wetlands	Various Subtypes	G1/G2	S1
Coastal Plain Dry Calcareous Forests and Woodlands	Coastal Plain Dry Calcareous Forests	G1	S1
Mesic Mixed Hardwood Forests	Northern Coastal Plain Mesic Mixed Hardwood Forest	G5	S5
Oak/Heath Forests	Coastal Plain Mixed Oak/Heath Forest	G4/G5	S4

G1 = Critically imperiled
G2 = Imperiled
G3 = Vulnerable
G4 = Apparently secure
G5 = Secure

S1 = Extremely rare
S2 = Very rare
S3 = Vulnerable
S4 = Apparently Secure
S5 = Secure

Source: Van Alstine et al. 2003; Flemington and Patterson 2010

? = Rank uncertain or approximate

2.8 Ecological Areas

The primary factor influencing the protection of threatened and endangered species at the Station is the protection of habitats that are important to the continued survival and expansion of threatened and endangered species populations. In addition to the protection afforded state and federally listed species, the Navy also recognizes the importance of protecting rare or declining species to prevent them from becoming listed in the future. Though no formal critical habitat has been designated at the Station, a number of ecologically significant communities that support or have the potential to support rare or at risk species have been identified (Van Alstine et al. 2003). These communities, as well as existing information on rare species have formed the basis for the designation of eight ecological areas that merit conservation and protection at the Station. Six of the ecological areas are located at WPNSTA (Figure 2-9) and three at CAX (Figure 2-10). Several of the sites have boundaries that overlap portions of CNHP as well. A detailed discussion of the eight ecological areas is provided in VDCR-DNH 2002 survey report (Van Alstine et al. 2003) and summarized in the following sections.

2.8.1 Ballard Creek Ravines

The 736-acre Ballard Creek Ravines Ecological Area is located in part on WPNSTA and in part on CNHP (Figure 2-9). The WPNSTA portion encompasses approximately 172 acres that lie between Barracks Road and Ballard Creek. The site includes a cleared picnic area and the surrounding wooded slopes. Significant natural heritage elements include four small stands of Coastal Plain Dry Calcareous Forests and Woodlands, an extremely rare community type in Virginia (see Section 2.8), and a bald eagle nest site protection zone. The actual nest site falls outside of the WPNSTA boundary.

2.8.2 Roosevelt Pond

The Roosevelt Pond Ecological Area is approximately 230 acres that includes portions of WPNSTA and CNHP. The site includes Roosevelt Pond and its surrounding ravines and tributaries on the WPNSTA (215 acres) and a small area of CNHP extending east of the WPNSTA (15 acres) (Figure 2-9). The site was previously identified as the Bracken's Pond Natural Area (U.S. Navy 1996) because of a population of the state-rare fibrous bladderwort (*Utricularia striata*) that occurs in Bracken's Pond on CNHP property. Additional natural heritage resources includes two stands of high quality and exemplary Basic Mesic Forests (Coastal Plain Basic Mesic Forest subtype). These communities occur on the slopes along the western shore of Roosevelt Pond (Figure 2-9).

2.8.3 King Creek Ravine

The King Creek Ravine Ecological Area includes the slopes and ravine along an unnamed tributary of King Creek in the western portion of WPNSTA. The approximately 116-acre ecological area supports an occurrence of the rare Coastal Plain/Piedmont Basic Seepage Swamps community (Figure 2-9). This community is currently only known from three counties in southeastern Virginia where underlying Tertiary shell deposits create calcareous soil conditions. Several diagnostic watchlist species occur on this site, including drooping bulrush, shadow-witch orchid, and swamp lousewort (*Pedicularis lanceolata*).

2.8.4 Black Swamp Ravines and Flatwoods

The Black Swamp Ravines and Flatwoods Ecological Area is a large area (3,337 acres) in the central and southwestern sections of WPNSTA (Figure 2-9). The site encompasses most of the Black Swamp and Blows Mill Run drainage basins and an extensive area previously identified as the Curtis Cemetery Sinkhole Pond Special Interest Area (Buhlmann and Ludwig 1992, U.S. Navy 1996). This site contains an outstanding diversity of natural communities, including several that are endemic to the mid-Atlantic Coastal Plain. Three occurrences of Basic Mesic Forests (Coastal Plain Mesic Calcareous Ravine Forest subtype), three occurrences of Coastal Plain/Piedmont Basic Seepage Swamps, one occurrence of Coastal Plain Dry Calcareous Forests and Woodlands, and a complex of Coastal Plain Depression Wetlands were documented within this ecological area (Figure 2-9). Each of these rare community types is geographically restricted and associated with specialized calcareous soil environments of the Coastal Plain. The state-listed Mabee's salamander was found within the depression wetlands complex that occurs in this area in 1990 and 1991, and an occurrence was reconfirmed in this area in 2007 (Petersen 2007).

The level, southeastern portion of the site contains a significant occurrence of an additional community, Oak/Heath Forests. This community group is relatively secure and common throughout its range, but is subject to multiple disturbances including clearcutting, gypsy moth infestation, and development. The most extensive natural community of the ravines is the Mesic Mixed Hardwood Forests, which is a relatively common community on most of the Coastal Plain and Piedmont. However, three outstanding and exemplary stands of this community, with scattered large, mature trees (diameter breast height (DBH) up to 69 inches), occur within the Black Swamp drainage (Van Alstine et al. 2003).

2.8.5 Halstead Road Sinkhole Ponds

The Halstead Road Sinkhole Ponds Ecological Area encompasses 158 acres of relatively level terrain that supports a mix of hardwood and pine forests that have appeared to be heavily cut or cleared in the past. A second complex of the significant Coastal Plain Depression Wetlands ecological community is located within this designated area (Figure 2-9). Much of the area adjacent to these ponds has been converted to pine plantation and no longer supports the unique habitat characteristics of the ponds.

2.8.6 Pond 11

The Pond 11 Conservation Area is 265 acres in size, and it encompasses all of Pond 11 and most of the tributary and ravine system surrounding the area. The site supports one active and one abandoned bald eagle nest. A third nest was in a large snag that is no longer standing. The ecological area boundary includes a 1,320-foot (0.25-mile) radius protection zone plus a 328-foot buffer because of uncertainty of the exact nest locations. No significant ecological communities have been identified in this ecological area.

2.8.7 Jones Millpond

The Jones Millpond Ecological Area (218 acres) encompasses the central portion of the Jones Millpond tract at CAX and includes a 1,320-foot (0.25-mile) radius protection zone centered on a bald eagle nest found in 2002 (Figure 2-10). No significant ecological communities have been identified in this ecological area.

2.8.8 Lower Queen Creek

The portions of the Lower Queen Creek Ecological Area are located on the newly acquired 786-acre parcel of CAX and a portion of Camp Peary that is adjacent to the western boundary of CAX (Figure 2-10). Small portions of the site occur in the northeast corner of the Jones Millpond tract and a small area below Cheatham Pond on the western boundary of the CAX main base. A total of 590 acres of the approximately 1,452-acre site are on CAX. The boundaries of this ecological area within CAX encompass previously documented occurrences of the state-rare bog twayblade and mountain camellia, and an upland area that provides watershed protection for downstream significant ecological communities of Coastal Plain Basic Seepage Swamp (Figure 2-10). A rare community of Coastal Plain Dry Calcareous Forests and Woodlands also occurs in this ecological area (Figure 2-10). Other natural heritage resources located within this ecological area at CAX are exemplary stands of Oak/Heath Forests and Basic Mesic Forests (Coastal Plain Basic Mesic Forest subtype) ecological communities.

3.0 ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

3.1 Management Strategy

The long-term success of conservation efforts, at the Station and within the region, depends upon natural resources management at the ecosystem level. Ecosystems are complex and dynamic by nature, with components that are interrelated and operating at different rates. The distribution and abundance of species and communities and underlying ecological and physical processes occur irrespective of land ownership or management boundaries. This INRMP provides the overarching goal of protecting the properties and functions of natural ecosystems through the incorporation of an ecosystem management approach into Station fish and wildlife management, grounds maintenance, land restoration, endangered species, noxious plant and animal control, natural resource law enforcement, research, and overall conservation education programs. The goal of the Station's ecosystem management strategy is to manage selected ecosystem components in a manner that provides long-term sustainability of resources to support the military mission and the biodiversity and species richness of the region.

An important component of ecosystem management is adaptive management. Because knowledge of ecological systems and processes is inherently limited (due in part to changing conditions), we must continuously learn how to manage better. Hypothesis testing, assessments of the efficacy of management techniques, and incorporation of knowledge gained over time are key to successful adaptive management. The Station is committed to identifying trends, measuring and surveying needs, and providing management recommendations to offset negative trends or where management activities are having no effect. It will also identify what is working well and assist in developing correlations between management measures, species population and distribution, and habitat quality and condition. Having a science based systematic process to help determine what management efforts are working best will help prioritize funding and resource allocation.

The natural resources program at the Station is part of a region-wide Navy Natural Resources Program that is overseen by a Regional Natural Resources Program Manager. The natural resources staff fall under the direction of the Station Environmental Director. Program areas managed by natural resources staff encompass traditional resources issues such as forestry, fish and wildlife management, and station hunting and fishing programs. The staff also ensures compliance with applicable local, state, and federal regulations regarding the management and protection of the Station's natural resources. Natural resources staff also promotes environmental awareness to the public and to Station personnel by managing volunteer programs and sponsoring natural resources activities in the community. The Station's natural resources management program is broadly responsible for forest management, fish and wildlife management, outdoor recreation management, and land management. Each of these areas of responsibility must be strategically managed to balance potential conflicts between each other and the Station's military mission. A brief overview of activities and general description of natural resources program responsibilities follows.

Wetlands Protection and Mitigation. Wetlands identification and protection are an important part of natural resources management and aquatic resource protection at the Station. A total of approximately 856 acres of wetlands has been mapped at WPNSTA, 298 acres at CAX, and 28 acres at YFT. Although the existing wetland mapping is adequate for planning purposes, all proposed construction and land-disturbing activities that have the potential to impact wetlands are reviewed by natural resources staff on an individual basis. When impacts to wetlands are unavoidable, natural resources staff oversee wetland mitigation design and construction.

Water Quality Protection. In an effort to protect water quality on the Station and surrounding watersheds, natural resources staff have identified over 100 erosion sites, including shoreline stabilization projects, and committed funding to accomplish repairs. Natural resources staff review erosion and sedimentation control plans for construction sites and provide oversight to ensure all best management practices (BMPs) are being enforced. Additionally, natural resources staff organized and coordinated the planting of over 6,500 linear feet of riparian buffer zone and 200 acres of upland on the Station.

Site Restoration. The natural resources program is responsible for the restoration and maintenance of a number of sites on which buildings or other facilities have been demolished and the long-term maintenance of a number of IRP sites that have undergone or are undergoing remediation. The goals of restoration are to return the sites to natural ecological community types to prevent erosion, enhance wildlife habitat, and reduce maintenance costs.

Grounds Maintenance. Oversight of the grounds maintenance program provides opportunities to enhance the visual appeal of the environment, enforce beneficial landscaping concepts, improve wildlife habitat, and reduce the costs of grounds maintenance to the Station.

Forest Management. Station natural resources staff are responsible for timber management, forest administration, timber sales, reforestation, timber stand improvement, access road construction and maintenance within the timber stands, and forest protection. Forest management objectives include the following: to manage for a diversity of habitats; to maintain wildlife travel corridors, streamside, and aesthetic buffer zones; to enhance diversity in plant communities; and to ensure consistency with an ecosystem approach to forest management. Natural resources personnel have recently completed state certification for prescribed burning to aid in forest maintenance. Complete forest inventories were conducted in 1998 and 1999 at CAX and WPNSTA, respectively. The survey included 7,253 forested acres at WPNSTA and 738 acres at CAX. The collection of forest inventory data for the CAX 789-acre expansion parcel is underway and will be included in the next annual update when available. The inventories reported that overall timber quality at the Station was well above average and was exceptional in several stands.

Fish and Wildlife Management. The natural resources staff support an active wildlife management program that includes maintaining a variety of habitat types, including early successional scrub-shrub habitat, native warm season grasses, and mature and intermediate forests. A number of food plots are maintained to provide winter habitat and food sources for wildlife. The Station began participating in the VDGIF Deer Management Assistance Program in 1997. This program assists the state in gathering information about white-tailed deer (*Odocoileus virginianus*) populations and allows the department to better manage deer numbers

statewide. Natural resources personnel serve as game wardens on the Station to enforce state and federal fishing and wildlife laws. Other wildlife studies that are conducted to provide information on the health and status of wildlife populations include annual quail and rabbit surveys to help assess statewide population trends, breeding bird surveys, and fisheries inventories.

Outdoor Recreation. Hunting is the primary outdoor recreation activity at WPNSTA and CAX. The Station has had 500 participants in its hunting and fishing programs each year while maintaining restrictive access requirements of an ordnance installation, supporting military readiness, and meeting ecosystem management goals. Administration of the fishing and hunting programs also includes requiring all participants in the hunting program to complete a safety course long before this was a state licensing requirement. A hydraulically operated hunt stand was installed in 2002 to enhance hunting opportunities for the disabled.

Environmental Awareness and Community Outreach. Natural resources staff promote environmental awareness to the public and Station personnel by managing volunteer programs and sponsoring natural resources education in the community. Staff members and volunteers participate in a variety of public outreach programs such as Earth Day events, beach cleanups, and Scouting activities.

Threatened and Endangered Species Management. The natural resources program at the Station places great emphasis on threatened and endangered species protection and habitat protection. Several threatened and endangered species and significant natural habitat surveys have been conducted over the past 15 years. No federally-listed species have been identified to occur at the Station; however, several state-listed species and rare habitat types have been identified and delineated as conservation areas to ensure the continued protection of the Station's significant natural heritage resources.

Pest Management. The Station uses integrated pest management (IPM) strategies such as changing practices and/or making habitat or structural alterations rather than relying on chemical treatments to control pests. Careful use of pesticides to control targeted pests occurs only when indicated and with minimum use of the least toxic product available. The Station currently operates under a pest management plan developed in conjunction with Northeast Atlantic Division, Naval Facilities Engineering Command (NORTHDIV) and a site-specific Integrated Pest Management Plan developed by NAVFAC Atlantic for the Station.

3.2 Achieving No Net Loss to the Military Mission

Section 101(b)(1)(I) of the Sikes Act states that each INRMP shall, to the extent appropriate and applicable, and consistent with the use of the installation to ensure the preparedness of the Armed Forces, provide for "no net loss in the capability of military installation lands to support the military mission of the installation." It is DoD policy that appropriate management objectives to protect mission capabilities of installation lands (from which annual projects are developed) be clearly articulated, and receive high priority in the INRMP planning process (Navy 2006).

The effectiveness of this INRMP in preventing "net loss" will be evaluated annually. Mission requirements and priorities identified in this INRMP will, where applicable, be integrated into other environmental programs and policies. It is not the intent that natural resources are to be consumed by mission requirements, but rather are sustained for the use of mission requirements. To achieve this, the goal of this INRMP is to conserve the environment for the purpose of the military mission. There may be instances where a "net loss" may be unavoidable to fulfill regulatory requirements other than the Sikes Act, such as complying with a biological opinion under the provisions of the Endangered Species Act, or from the protection of wetlands under the provisions of the Clean Water Act (CWA). However, the USFWS and USACE are required to adhere to the Sikes Act provision of no net loss. Loss of mission capability in these instances will be identified in the annual update of the INRMP and will include a discussion of measures being undertaken to recapture any net loss in mission capability.

3.3 Planning for NEPA Compliance

Prior to passage of Sikes Act legislation the extent of natural resources management on military lands was largely discretionary. Although installations with applicable natural resources were required to prepare natural resources plans, it was not a legal requirement. The only legal natural resources requirements for installations were related to compliance with ESA, CWA, and other statutory requirements; or DoD directives. Passage of the SAIA brought into effect the requirement for "the Secretary of each military department to prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary" (Navy 2006). The CEQ defines an INRMP as a major federal action requiring NEPA analysis, and as a result the Navy Office of General Counsel (Installations and Environment) has established that implementation of an INRMP per SAIA requirements, necessitates the preparation of NEPA documentation prior to approval of the INRMP. The preparation of an EA is usually sufficient to satisfy the NEPA review requirement for most installation INRMPs, however, in cases where implementation of the INRMP will have significant impact on the environment, the preparation of an EIS is required. Annual updates and revisions are covered by the original NEPA documentation unless a major change in installation mission or program scope occurs.

Decisions that affect future land or resource use that are associated with an INRMP require NEPA analysis. The NRM should refer to Secretary of the Navy Instruction (SECNAVINST) 5090.6A and Chapter 5 of OPNAVINST 5090.1C for basic guidance on the preparation of NEPA documents. CEQ's "Regulations for Implementing NEPA" (available at: http://ceq.hss.doe.gov/nepa/regs/ceq/toc_ceq.htm) and "NEPA's 40 Most Asked Questions" (available at: http://ceq.hss.doe.gov/nepa/regs/40/40p3.htm) provide further information. The INRMP and associated NEPA documentation should be prepared as individual documents to ensure that the viability, integrity, and intent of each are maintained. The intent of the INRMP is to outline projects that would fulfill Navy compliance and stewardship obligations, whereas the intent of the NEPA documentation is to analyze the impacts of the various program management options outlined within the INRMP. Although each of these documents are prepared as separate documents, they should be prepared simultaneously, as it is important for installation natural

resource managers to coordinate the two documents at the earliest possible stage to ensure that decisions reflect current environmental values, and avoid potential conflicts.

Preparation of the NEPA documentation should be completed early to accommodate Navy decision-makers. If a comment period or public notice is required for NEPA process, public notice and comment periods should be coordinated and integrated with the INRMP. A FONSI must be achieved before an INRMP may be approval. If a FONSI is not achievable, the NEPA process must proceed to an EIS. One of the first steps in the NEPA process is to define the proposed action and explain its purpose and need. The proposed action is to develop and implement an INRMP that integrates natural resources management with the installation's military use in a manner that ensures military readiness and provides for sustainable multipurpose uses and conservation of natural resources (Navy 2006). The purpose and need for the INRMP is to meet statutory requirements imposed by the SAIA as well as the requirements of various DoD, Navy, and Navy Instructions. The Purpose and Need section can be further clarified with a brief discussion of the required plan elements (as outlined in the SAIA) applicable to the installation.

The majority of the NEPA document should focus on the discussion of relevant environmental issues and reasonable alternatives. Alternatives that are not feasible because they are inconsistent with the installation mission, unreasonably expensive, too technically or logistically complex should not be included in the analysis. Additionally, any alternatives that are associated with significant environmental impacts cannot be analyzed in an EA, and would require preparation of an EIS. The CEQ defines reasonable alternatives as those that are economically and technically feasible and utilize common sense. Feasibility is a measure of whether the alternative makes sense and is achievable. The analysis should focus on the alternatives and methodologies proposed for accomplishing the management objectives for the program elements. Appendix E of the 2006 Navy INRMP Guidance document recommends that the NEPA analysis for INRMP documents adopt a "programmatic" approach that provides opportunities for the installation to accommodate unforeseen projects that meet pre-established criteria for significance evaluation, as well as changes to the projects, as long as impacts are covered within the overall scope and analysis for the selected alternative (Navy 2006). Analysis in the NEPA document will focus on evaluation and comparison of alternative plans in association with four management objectives: forestry management, fish and wildlife management, land management, and management for outdoor recreation opportunities. Analysis should not focus on the individual projects or practices except in the cases of controversial projects, or projects considered outside the scope of, or a major deviation from a previously existing INRMP (Navy 2006). The projects and recommendations outlined in an INRMP should provide a framework for reviewing on-going activities, and will also assist in reviewing changes for unforeseen projects or modifications in the future. It is important to distinguish that the NEPA analysis for evaluating plans/programs is different from the project level of analysis used for project specific actions.

The No Action Alternative should always be included as an alternative to implementation of the INRMP. The No Action Alternative describes impacts that would occur if the installation did not implement the INRMP, and the installation continued to operate without a plan or the existing plan if one is in place. The No Action Alternative serves as a baseline to which all other alternatives are compared. Each alternative should describe the general geographical extent

applicable to each of the management objectives and program elements. Each of the reasonable alternatives may only represent variable intensities of one or more of the management objectives and program elements; however, differences in funding levels for each alternative would not constitute a valid range of alternatives. For example, it is not acceptable for all required compliance projects to represent an alternative. A brief summary of all alternatives considered for the INRMP should be include to provide the review agencies and the local community the range of management scenarios that were analyzed.

Although specific projects are not required to be analyzed in the NEPA document, a complete list of projects, including description, cost estimate, funding priority designations, and implementation schedule must be included to provide the basis of the proposed action. If agency stakeholders and the Navy determine that potential projects are controversial, sufficient project details must be provided in the INRMP so that a decision can be made regarding significance as part of the NEPA analysis. Additionally, controversial projects, or projects outside the scope or intent of the INRMP, may require a tiered or amended NEPA document for that specific project. All projects must be consistent with the methodologies analyzed in the NEPA document, and the installation should ensure that the NEPA documentation for the INRMP is prepared such that it will accommodate for unforeseen projects, and changes to original projects. Reference Appendix E of the Navy INRMP Guidance document (Navy 2006) for more information on NEPA requirements evaluation of INRMP documents.

Advanced planning and coordination are required to ensure compliance with NEPA and a number of other environmental regulations, including the following:

- Clean Air Act (CAA), 42 USC §7401 et seq.;
- Clean Water Act (CWA), 33 USC §1251-1387;
- Coastal Zone Management Act (CZMA), 16 USC §1451 et seq.; and,
- Endangered Species Act (ESA), 16 USC §1531 et seq.

The proponent of any action at the Station that has the potential to impact natural resources or may require state or federal permits must contact the Regional Environmental Group NEPA Program. A description of the proposed project and a Project/Planning Environmental Checklist (Appendix B) should be submitted to assess the potential environmental consequences and planning requirements.

3.4 Public Access and Outdoor Recreation

The Sikes Act requires that military installations provide public access for use of natural resources to the extent it is appropriate and consistent with the military mission. Because most of the natural areas at WPNSTA occur within the restricted area, outdoor recreation opportunities are limited. CAX, however, is much less encumbered by mission activities and offers more opportunities for outdoor recreation. Hunting, fishing, or trapping is not authorized at YFT. Primary objectives of outdoor recreation and environmental awareness management at the Station are to:

- Improve the quality of life for Station personnel, their dependents, and the military community by providing for outdoor recreation opportunities to the maximum extent possible within the constraints of the military mission and capability of the natural resources; and,
- Foster understanding and awareness of the environment through educational programs.

3.5 GIS Management, Data Integration, Access, and Reporting

The Commander, Navy Region Mid-Atlantic's (CNRMA) GeoReadiness Center (GRC) is the single, authoritative source and distribution point for all geospatial information within the area of responsibility of the Navy Mid-Atlantic Region and is managed by the Mid-Atlantic Facility Engineering Command GIS Division. The GRC houses the most current geospatial information (including aerial photography) for the entire Navy Mid-Atlantic Region and provides access to the comprehensive data set and analysis tools to Regional and DoD decision makers/managers, sponsored contractors, and other sponsored individuals via a secure government Internet site. GIS data for the Station, including those environmental layers used for the development of this INRMP, can be accessed through the portal at:

(https://portal.navfac.navy.mil/portal/page/portal/am/mid-atlantic/am_ml_au/gis/).

Baseline environmental data layers include:

- Soils
- Topography
- Vegetation Cover
- Forest Stands
- Biosolids application areas
- Hunting compartments
- Property boundaries
- Wetlands
- Shale barren rock cress locations
- Storm water detention ponds
- Hiking trails

Environmental planners, project managers, engineers and sponsored contractors are encouraged to use the portal to access GIS data for analysis, development of maps and project planning. In addition, the portal provides guidance documentation for the collection of new geospatial data.

3.6 Training of Natural Resources Personnel

The SAIA states "Section 107 of the Sikes Act (16 U.S.C. 670e-2) requires sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel to be available and assigned responsibility to perform tasks necessary to

carry out Title I of the Sikes Act, including the preparation and implementation of integrated natural resource management plans." The effectiveness of this INRMP is greatly enhanced by the professional development of natural resources management staff. Professional development of staff requires the maintaining of staff knowledge through training and participation in conferences and workshops.

The management of natural resources requires a specialized skill set on the part of personnel. In addition to holding science based degrees, environmental personnel acquire skills by attending training through the Civil Engineering Corps Officers School (CECOS), the Shipley Group, USFWS (National Conservation Training Center), USACE, the wetland institute, various university programs and Defense Environmental Network and Information Exchange (DENIX). Table 3-1 lists contact information for available training.

Natural resources staff keeps abreast of current issues by attending annual workshops or conferences held by various professional societies. Societies such as National Military Fish and Wildlife Association, The Wildlife Society, Society of American Foresters, and Society for Ecological Restoration all host annual meetings focused on the management of natural resources. Additionally, it is recommended that persons interested in natural resources management familiarize themselves with the natural resources that are accessible within the vicinity of the particular installation. Some options available are visits to nearby parks, reserves, and other natural areas with an in-depth field guide to develop a practical sense for the areas natural history.

Table 3-1. Natural Resources Training Opportunities

U.S. Government, DoD
Defense Environmental Network & Information Exchange (DENIX) Training and Education Website: https://www.denix.osd.mil/portal/page/portal/denix/conferences
U.S. Navy Civil Engineer Corps Officers School (CECOS) Environmental Training Program 3502 Goodspeed Street, Suite 1 Port Hueneme, CA 93043-4336 Tel: 805-982-2895 DSN: 551-2895 Fax: 805-982-2918 Website: https://www.netc.navy.mil/centers/csfe/cecos/
U.S. Army Corps of Engineers (USACE) Professional Development Support Center 550 Sparkman Drive Huntsville, AL 35816 Tel: 256-895-7401 Fax: 256-895-7465 Website: http://pdsc.usace.army.mil/

U.S. Government, non-DoD
U.S. Fish and Wildlife Service National Conservation Training Center Route 1, Box 166 Shepherdstown, WV 25440 Division of Training: Tel: 304-876-7472 Aquatic Resources: Tel: 304-876-7445 Environmental Conservation: Tel: 304-876-7475 Wildlife: Tel: 304-876-7434 Technical (e.g., GIS) Tel: 304-876-7456 Website: http://training.fws.gov/
Non-Government Organizations
Wetland Training Institute, Inc. P.O. Box 31 Glennwood, NM 88039 Tel and Fax: 877-792-6482 Website: http://www.wetlandtraining.com/
The Shipley Group P.O. Box 908 Farmington, UT 84025 Tel: 888-270-2157 Website: http://www/shipleygroup.com
Universities
Duke University Nicholas School of the Environment and Earth Sciences Continuing Education Program Box 90328 Durham, NC 27708-0328 Tel: 919-613-8082 Fax: 919-684-8741 Website: http://www.env.duke.edu/cee/execed.html
University of Wisconsin-Madison Gaylor Nelson Institute for Environmental Studies Science Hall, 550 North Park Street Madison, WI 53706-1491 Tel: 608-263-1796 Website: http://www.ies.wisc.edu/

4.0 NATURAL RESOURCE MANAGEMENT

4.1 Wetlands and Water Quality Protection

Natural resource mangers will 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 the Station 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 of the Federal Register.

Due to the importance of wetlands and water quality to ecosystem health and the human environment, a large number of state, federal, and local laws regulate land use and actions that have the potential to degrade wetlands and water quality. Executive Order (EO) 12088, Federal Compliance with Pollution Control Standards, EO 11990, Protection of Wetlands, and the CWA require federal facilities to comply with all substantive and procedural requirements applicable to point and nonpoint sources of pollution. In accordance with these requirements, the Station must obtain all appropriate federal, state, interstate, and local certifications and permits required by point and nonpoint pollution control, groundwater protection, dredge and fill operations, and storm water management programs for any action that may impact water quality. In addition, any action that requires these types of authorizations must also be assessed under NEPA, and if no practicable alternative is found, appropriate mitigation measures must be taken.

4.1.1 Wetlands Protection

Under Section 404 of the CWA, discharge of dredged and fill material into waters of the United States, including wetlands, is prohibited unless a permit is issued by the USACE. A number of USACE Nationwide Permits (NWPs) may be used to streamline the permitting process for activities that would have minimal adverse effects on aquatic environments. Activities such as the maintenance of existing structures, residential construction, reshaping existing drainage ditches, and recreational facilities may be permitted under NWPs. The maximum acreage limits of most of the NWPs is one-half acre, though notification to the District Engineer for activities that result in the loss of greater than one-tenth acre of waters of the United States or exceed other criteria noted within the NWPs is generally required (67 Federal Register 2080). If project impacts are expected to exceed these criteria, an individual permit must be sought.

> *Detailed information regarding current regulatory programs of the USACE is available at http://operations.usace.army.mil/regulatory.cfm.*

The Station 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 EO 11990, Protection of Wetlands, and White House Office on Environmental Policy. Although permits may be obtained that allow for the filling of wetlands, in accordance with EO 11990, federal agencies may do so only after finding an alternative that avoids or minimizes impacts to aquatic

resources to the maximum extent practicable. 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 2694(b) of title 10, United States Code. Off-site mitigation may provide a preferred alternative to meet watershed protection and ecosystem goals and meet future mission requirements. The enhancement and/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 section 1344 of title 33, United States Code.

The Virginia Water Protection Permit Program (9 Virginia Administrative Code 25-210) requires additional state permits for any impacts to state waters and wetlands, including isolated wetlands not regulated by the USACE. Activities requiring a permit include dredging, filling, or discharging any pollutant into or adjacent to surface waters, or otherwise altering the physical, chemical, or biological properties of surface waters, excavating in wetlands, or conducting any of the following activities in a wetland:

- New activities that cause draining which significantly alters or degrades existing wetland acreage or functions;
- Filling or dumping;
- Permanent flooding or impounding; and,
- New activities that cause significant alteration or degradation of existing wetland acreages or functions.

Military construction and other projects with the potential to disturb wetlands are to be reviewed individually with regard to wetland impacts, and the appropriate permits are sought as needed.

Information on individual and state permit requirements and application procedures is available on the VDEQ website: http://www.deq.state.va.us/wetlands/.

4.1.2 Watershed Protection

The Station is located within the Chesapeake Bay watershed and therefore, management restrictions established by the Chesapeake Bay Protection Act (Virginia Code §10.1-2100) apply to land use and development. Areas within the Chesapeake Bay watershed are designated as Resource Protection Areas (RPAs) or Resource Management Areas (RMAs), where land use activities have the potential to impact the bay. RPAs and RMAs are set by local Chesapeake Local Assistance Boards and can vary from county to county. In York and James City counties, and the City of Newport News, RPAs include tidal wetlands, nontidal wetlands that are connected by surface flow and contiguous to tidal wetlands or perennial streams, perennial streams, and a 100-foot buffer adjacent to these areas. In York County, RMAs include a 500-foot buffer around RPAs; in the City of Newport News, RMAs include a 100-foot buffer around RPAs; and in James City County, all of the land outside the RPA is an RMA. The Chesapeake

Bay Protection Act requires that all land use, development, and redevelopment within these areas meet performance criteria defined in the regulation.

Useful guidelines on preservation area designation and management regulations are available on the Chesapeake Bay Local Assistance Department website: http://www.dcr.virginia.gov/chesapeake_bay_local_assistance/index.shtml.

In support of the Chesapeake Bay Preservation Act, a planning-level GIS layer of the RPAs and RMAs at the Station has been created based on the current wetlands delineation and should be referenced when land use changes and development projects are proposed. Field verification and concurrence from the appropriate County Planning Department must also be sought prior to any construction activities within these zones.

The federal Chesapeake Bay Restoration Act of 2000 (33 USC §1267) provides further protection to the Chesapeake Bay watershed. This Act made compliance with various Chesapeake Bay agreements mandatory by the DoD. Included are the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*, the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan* (FACEUP), and the 2000 *Chesapeake 2000 Agreement* (C2K). These agreements identify goals and commitments aimed at the preservation and restoration of the Chesapeake Bay.

Major goals of the Chesapeake Bay agreements are to reduce nutrients and toxins entering the bay, protect stream corridors, enhance and protect wetlands, protect priority watersheds, identify and control invasive species on priority sites, and expand conservation landscaping on federal facilities. Many of the natural resources management actions undertaken at the Station, including riparian forest buffer enhancements, shoreline protection, reduced mowing, invasive species control, and habitat restoration directly support these goals and help fulfill Navy commitments. Over the past several years, the natural resources program and the Virginia Marine Resources Commission have worked cooperatively to establish and enhance riparian forest buffers at WPNSTA. To date, three sites totaling over 6,500 linear feet of riparian buffer zone and 200 acres of upland have been established on the Station. Established riparian buffers include a 100-foot buffer along both sides of Skiffes Creek and approximately 200 acres of upland buffer in the Q Area, a section of Felgates Creek near Turkey Road, and a small area where mowing was ceased along Blows Mill Run.

Another Chesapeake Bay improvement effort that the Station participated in is the establishment of an oyster reef at the mouth of Felgates Creek. Through a partnership with VIMS, the Station helped establish an artificial oyster reef stocked with oysters grown by local volunteers to help restore the filtering function formerly provided by extensive, healthy oyster beds in the Chesapeake Bay.

4.1.3 Floodplain Protection

As with waters of the United States and wetlands, discharges of dredged or fill materials within 100-year floodplains, as identified through FEMA's flood insurance rate maps (Figures 2-7 and

2-8), are regulated by the USACE. Most NWPs cannot be secured for use in the 100-year floodplains and almost every permit requires notification to the District Engineer. Floodplains receive additional protection through EO 11988, Floodplain Management, which instructs federal agencies to reduce the risk of flood loss by not building in floodplains and to restore and preserve the natural and beneficial values served by floodplains.

4.1.4 Storm Water Quality

Storm water management is an important part of water quality protection. Runoff from impermeable and exposed surfaces into the Stations storm water drainage systems can facilitate the transport of industrial pollutants into receiving waters. A Final Storm Water Pollution Prevention Plan (SWP3) (U.S. Navy 2008) has been prepared for the Station to identify and map potential pollutant sources that may be expected to contribute to the contamination of the storm water discharges from permitted outfall drainage areas and recommend BMPs to control exposure. Potential sources of pollutants include outdoor industrial activities and processing areas; material storage and handling areas; areas where hazardous material/hazardous waste/or petroleum, oil, and lubricant products are stored; construction and demolition sites; and land areas where chemicals are applied. The plans also describe storm water management standards, storm water management controls, and BMPs used at the Station to maintain and protect water quality. The SWP3s were developed as a requirement of the Virginia Pollutant Discharge Elimination System (VPDES) and several other state and federal water pollution control regulations. Virginia Department of Environmental Quality (VDEQ) requires the Station to amend the SWP3s whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the potential for the discharge of pollutants to the waters of the state.

4.1.5 Erosion and Sediment Control

Erosion and sedimentation are major threats to water quality at the Station due to areas of steep terrain and high erosivity of many of the soils. Activities that remove vegetation and disturb the soil greatly increase the risk of erosion and sedimentation and therefore require the implementation of protective measures. Proposed construction projects that disturb one acre or more must obtain authorization under a VPDES Storm Water Discharge Permit for Construction Activities. Site-specific SWP3s that address runoff control during and after construction activities must be prepared for all construction projects at the Station. As with SWP3s for industrial discharges, SWP3s for construction sites must be updated as necessary to remain consistent with any changes needed to protect surface water resources.

Additional erosion and sedimentation control is provided by the Virginia Erosion and Sediment Control Law (Virginia Code §10.1-560). This law requires a written and approved erosion and sedimentation plan for any land-disturbing activity equal to or exceeding 10,000 square feet in area. An erosion and sedimentation control plan must be developed for disturbed areas greater than 2,500 square feet if a construction project is located within a Chesapeake Bay Preservation Area (VDCR 2003). Land-disturbing activities include, but are not limited to, clearing, grading, excavating, transporting, and filling of land. Regulated land-disturbing activities must comply with minimum standards outlined in the Virginia Erosion and Sediment Control Handbook (VDCR 1992). Natural resources staff and environmental protection specialists ensure that erosion prevention and control measures are included as specifications for all ground-disturbing

construction projects at the Station. The Station natural resources manager is trained as a Combined Administrator for Erosion and Sediment Control Programs by the VDCR. Frequent site visits during construction helps ensure compliance with sediment erosion and control plans and that BMPs are being implemented.

4.1.6 Coastal Zone Protection

The CZMA encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. Though federal lands are excluded from state coastal management areas, activities on federal lands that are reasonably likely to affect any land or water use or natural resources of designated coastal resources management areas must be consistent with the enforceable policies of the Virginia Coastal Resources Management Program. Consistency reviews are triggered for all federal actions inside the coastal zone and for actions outside the coastal zone that have the potential to affect Virginia's coastal uses and resources. All federal development projects inside the coastal zone are automatically subject to consistency review and require a consistency determination. Under the consistency clause, the state may prevent a federal action if it is found to be inconsistent with the state program. In Virginia, most of the Tidewater region is within the designated coastal resources management area.

An outline of Virginia's federal consistency review process is available on the VDEQ website: http://www.deq.state.va.us/eir/federal.html.

4.1.7 Oil and Hazardous Substance Spill Prevention and Protection

Though oil and hazardous substances (OHS) are not stored or used in significant quantities at WPNSTA or CAX, prevention of OHS spills is still important for the protection of environmentally sensitive areas. WPNSTA currently has a total fuel capacity of 241,435 gallons and CAX has a capacity of 7,315 gallons. YFT, on the other hand, has a capacity of over 29 million gallons, which, if a spill were to occur, could cause significant injury to fish, wildlife, and sensitive areas and could contaminate groundwater supplies for the base and adjacent communities.

Information on the storage and handling of OHS is provided in detail as part of the Spill Prevention, Control, and Countermeasures Plan (SPCCP) and Oil Discharge Contingency Plan (ODCP) for WPNSTA and CAX (U.S. Navy 2002a). The purpose of the SPCCP is to prevent the discharge of oil from onshore facilities into or upon the navigable waters of the United States or adjoining shorelines. These plans show the location of OHS storage areas, tank farms, secondary containments, and material loading/unloading areas and list the types and capacity of materials stored at each site. The plans also document the Station's efforts to protect storm water and environmentally sensitive areas from accidental discharge contamination. Environmentally sensitive areas that receive the highest priority for protection include water resources used as a potable water supply, wetlands and wetland transition areas, estuaries and other important

shellfish and finfish habitat, and the habitats of federal- and state-endangered or threatened species.

Because of the storage and transfer of large volumes of fuel at YFT, as well as the presence of a number of other naval and commercial fuel farms and refineries, there is a high potential for offshore fuel spills to occur on this region of the York River. To help identify and prioritize resources protection in the event of an oil spill, the National Oceanic and Atmospheric Administration (NOAA), Office of Response and Restoration has developed an environmental sensitivity index (ESI) and map series that illustrates sensitive coastal areas (NOAA 2010). Natural resources identified on ESI maps include shoreline types; the presence of shellfish beds; nesting areas for various types of birds; common local shellfish, finfish, and bird species; and known locations of threatened and endangered species. A number of socioeconomic features that would require protective measures are also displayed on the ESI maps. Protection methods that also are mapped include proposed boom placement locations, skimmer locations, and staging areas. The most current Virginia ESI maps are available for download from the NOAA internet site and should be referenced by natural resources managers when land use changes and development projects are proposed.

Of the shoreline types that occur at the Station, the sandy beaches along the York River are least sensitive to oil spills. This is due to their characteristic semi-permeable substrate, low potential for oil penetration and burial, and low densities of fauna living within the substrate. The hard substrate associated with fine sand beaches increases the ease of cleanup by allowing easy access by vehicular and foot traffic. The freshwater marshes and intertidal marshes are the habitats that are most sensitive to oil because of their high biological use and value for a wide range of species, the potential for long-term impacts, and the cleanup difficulty resulting from limited access. Sensitive resources associated with York River shoreline and each of the five tidal creeks at the Station are described below.

York River. Most of the York River shoreline along WPNSTA, CAX, and YFT consists of fine or coarse sand beaches. A number of sensitive exposed tidal flats and intertidal marshes also occur intermittently along the shore. A large area that includes portions of CAX and the York River are identified as a nesting area for raptors. Extensive shellfish beds of several species are identified within the York River, just offshore of the Station.

Queen Creek. Within Queen Creek, a variety of shoreline types exist including fine sand beaches, freshwater marshes, exposed tidal flats, and intertidal marshes. ESI maps identify several groups of oil sensitive wildlife in and adjacent to Queen Creek as well. On the north shore of Queen Creek, wading birds are indicated as being present year round and a number of ecological preserve areas are mapped. Two public beaches are also located within the boundaries of Queen Creek.

King Creek. Fine sand beaches and intertidal marshes are the main shoreline types at King Creek. Several shellfish beds are present at the mouth of the creek and two public beaches are located adjacent to tributaries of King Creek. No other oil-sensitive resources are mapped within the boundaries of King Creek.

Felgates Creek. Felgates Creek is predominately composed of intertidal marshes with smaller areas of fine sandy beaches. Other than the flora and fauna associated with the marshes, no oil-sensitive wildlife areas are mapped within the boundaries of Felgates Creek.

Indian Field Creek. The shorelines of Indian Field Creek consist almost entirely of intertidal marsh. The mouth of the creek is small, which allows easy isolation during spill events. No other groups of oil-sensitive wildlife are mapped that rely on Indian Field Creek for feeding, breeding, or nesting.

West Branch of Wormley Creek. The West Branch of Wormley Creek is located adjacent to the YFT near the mouth of the York River. This creek contains large areas of intertidal marshes and is located near an area with other biological significance. North of the creek's mouth, several shellfish beds exist containing several species of oysters and clams, which are present year-round.

4.1.8 Oil and Hazardous Substance Spill Response

The Commander, Navy Region, Mid-Atlantic (CNRMA) *Navy On-Scene Coordinator Oil and Hazardous Substance Pollution Contingency Plan* (U.S. Navy 2001) describes oil and hazardous substance spill notification and emergency procedures for all naval installations in the Mid-Atlantic Region. The plan provides for the coordination of response capability for other federal, state, and local government agencies, and private oil spill response agencies. The plan also establishes and assigns responsibilities for oil responders. The CNRMA is the predesignated Navy On-Scene Coordinator (NOSC) for the region; however, NOSC program responsibility has been delegated to the Regional Environmental Group (Code 910). The Installation Commanding Officer has Facility Incident Commander (FIC) duties, though responsibility may be delegated to the Incident Commander or other qualified response personnel. When directed by CNRMA, the NOSC representative will assume the role of FIC for incidents beyond the capability of the Installation Commander.

The Stations' Oil and Hazardous Substance Facility Response Plans give information specific to OHS spills at each installation. The plans are organized into the following three sections:

- An Emergency Response Action Plan (The Red Plan) is an abbreviated, critical action plan that defines key procedures that must be taken in the early stages of a response to an oil or hazardous substance spill. This plan functions as a concise, separate, stand-alone document for spills of any kind and addresses essential and time-sensitive procedures that must be followed.
- An Oil & Hazardous Substance Facility Response Plan (OHSFRP) is the in-depth response plan that addresses all aspects of the response, such as organization, assessment, establishment of priorities, environmental considerations, recommended clean-up techniques, training, and preventive maintenance. The OHSFRP provides essential guidance in addressing wide-ranging response actions and specific federal, state, and Navy planning requirements.

- The Supporting Annexes provide more detailed information, guidance, and supporting data that is important to the overall management of spill response operations.

The Station has access to both Public Works Center (PWC) and outside spill response personnel and equipment for handling oil spills. The PWC Oil Recovery group maintains a team of full time personnel at WPNSTA who are responsible for daily oil recovery operations. In the event of a large oil spill, support from the PWC, Norfolk Oil Recovery team would be sought. Response activities provided by PWC include equipment and personnel for the containment and cleanup of a spill.

4.2 Installation Restoration Sites

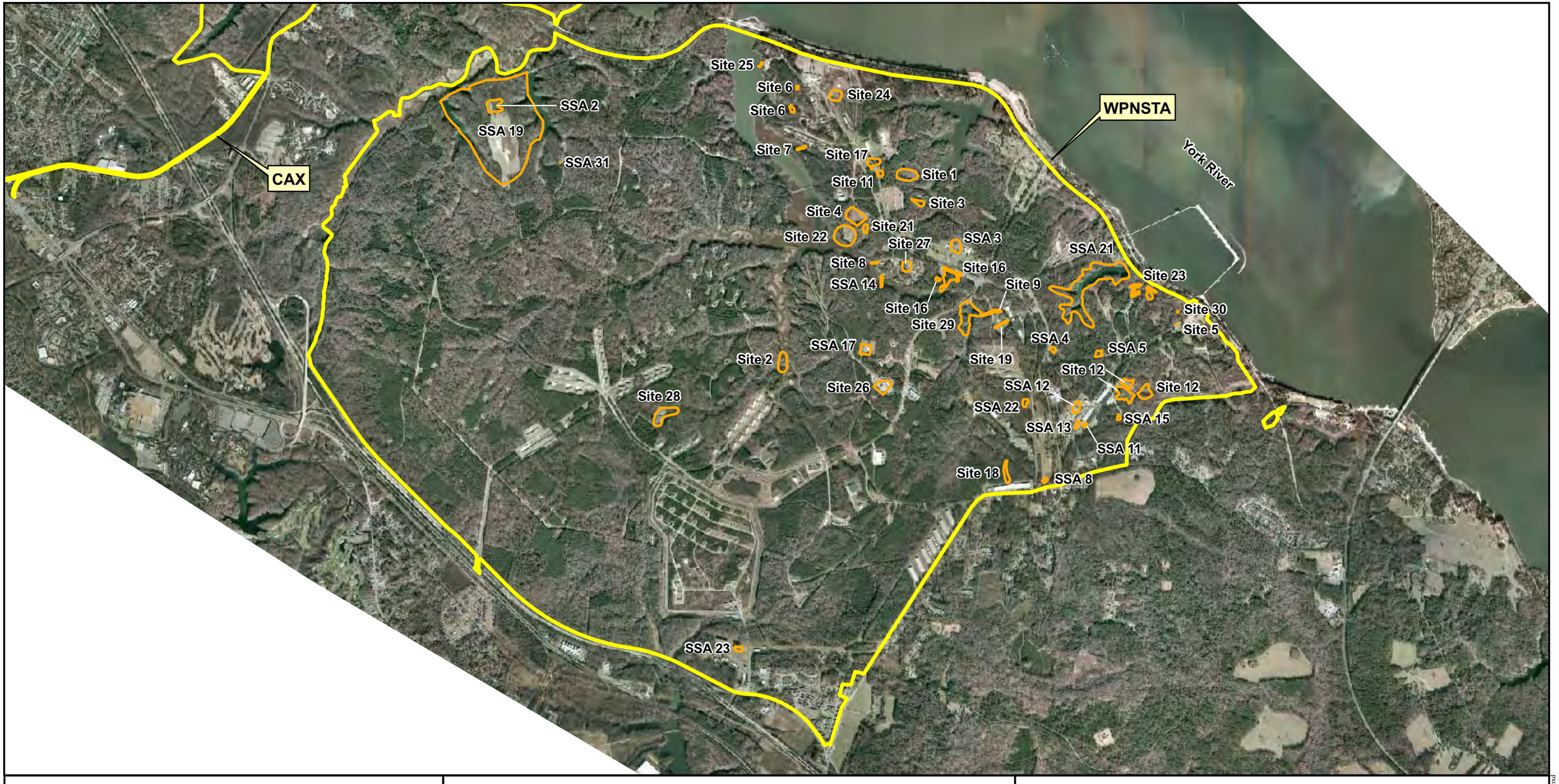
The Station recognizes that adverse impacts to natural resources addressed in this INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment. The IRP is responsible for identifying Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) releases, considering risks and assessing impacts to human health and the environment (including impacts to endangered species, migratory birds, and biotic communities), as well as developing and selecting response actions when it is likely that a release could result in an unacceptable risk to human health and the environment. When appropriate, Station natural resources staff assists the IRP Remedial Project Manager (RPM) in identifying potential impacts to natural resources caused by the release of these contaminants. Natural resources staff also participate in the IRP decision-making process by communicating natural resource issues on the Station to the RPM, attending Restoration Advisory Board meetings, reviewing and commenting on IRP documents (i.e., remedial investigations and ecological risk assessments), and ensuring that response actions, to the maximum extent practicable, are undertaken in a manner that minimizes impacts to the natural resources on the Station and in the surrounding area.

Remedial investigations at the Station have revealed a large number of sites contaminated with hazardous and non-hazardous waste resulting from past land uses and waste disposal practices. Contaminants include ordnance-related materials, asbestos, waste oils, paint, solvents, scrap metal, batteries, hydraulic and transmitting fluids, pesticides, and other materials. Because of the surrounding wetlands and potential environmental impacts, WPNSTA and CAX have been included on the National Priorities List of the Environmental Protection Agency (EPA) superfund sites. WPNSTA was listed in 1992 and CAX was listed 2000; the YFT is not on the National Priorities List (EPA 2009). A Federal Facilities Agreement (FFA) that describes the procedures under which the DoN, EPA, and the VDEQ will investigate and, if necessary, remediate sites at WPNSTA and CAX in accordance with CERCLA was signed in 1994 for WPNSTA and in 2005 for CAX (EPA 2009). The FFA originally established 16 sites, 19 site screening areas (SSAs), and 21 areas of concern (AOCs) for the WPNSTA and eight Source Areas for CAX (EPA 2009). Additional hazardous sites are located and documented as encountered and managed by the Station's IRP.

An IRP Site Mitigation Plan (SMP) has been prepared for the Station and is updated annually (Baker Environmental, Inc. 2002). The SMP describes all current and former IRP sites, SSAs,

and AOCs and sets priorities for remedial response activities to be conducted at the Station. Figures 3-1 and 3-2 show the location of all known areas of investigation at WPNSTA and CAX. Data were not available for creating a figure for YFT. However, 21 IRP sites have been identified at YFT and remediation is complete on all 21 of these sites.

Natural resources staff at the Station perform routine inspections and maintenance on a number of the IRP sites to ensure proper site conditions are maintained. These sites include two capped former landfills that must be maintained free of trees and other woody vegetation and a number of sites on which erosion must be monitored and controlled, access roads must be maintained, invasive species must be controlled, and proper drainage must be maintained. Table 4-1 presents the status and maintenance requirements of 18 sites currently monitored and maintained by the staff.



Legend

- Installation Areas
- Restoration Program Sites

Source: U.S. Navy 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 4-1. Installation Resoration Program Sites at WPNSTA.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

P:\GIS\Projects\NAVFAC\MXD\Report\Figure3-1RestorationProg.mxd

Legend

- Installation Areas
- Restoration Program Sites

Source: U.S. Navy 2009.

0 750 1,500 Feet

0 180 360 Meters

N

Figure 4-2. Installation Resoration Program Sites at CAX.

Prepared For:	NAVFAC Naval Facilities Engineering Command	
Prepared By:	TETRA TECH	**Date:** 04/2010

P:\GIS\Projects\NAVFAC\MXD\Reports\Figure3-2RestorationProgCAX.mxd

Table 4-1. Status and Maintenance Requirements for WPNSTA and CAX IRP Sites.

Site	Location/Description	Area	Status	Maintenance Requirements					
WPNSTA Installation Restoration Program Sites				**1**	**2**	**3**	**4**	**5**	**6**
Site 1	Dudley Road landfill	6 acres	Remediation complete	4	4	4	4	4	
Site 2	Turkey Road landfill	5 acres	Removal action complete		4		4		
Site 3	Group 16 magazine landfill	2 acres	Remediation complete		4	4	4	4	
Site 4	West Road burn pad residue landfill	10 acres	In remediation		4	4	4	4	
Site 6	Explosives-contaminated wastewater impoundment	3 acres	Remediation underway				4		
Site 7	Plant 3 explosives-contaminated wastewater discharge area	300 feet	Remediation complete		4		4		4
Site 12	Barracks Road landfill (Area A)	6.6 acres	Remediation complete	4	4	4	4	4	4
Site 16	West Road landfill (Shed C)	5 acres	Remediation complete		4				
Site 17	Holm Road landfill	2 acres	Remediation complete		4				
Site 21	Battery and drum disposal area	1 acre	Final RI submitted		4	4	4	4	4
Site 22	Burn pad	9 acres	Final RI submitted		4	4	4	4	4
Site 23	Building 428 Teague Road disposal area	2.3 acres	Remedial action planned		4	4	4		
Site 24	Aviation field	15 acres	Remedial action planned				4		
WPNSTA Site Screening Areas									
SSA 5	Bypass Road landfill	0.9 acre	Removal action complete		4				
SSA 8	Building 350 rail roundhouse maintenance area trench outfall	0.4 acre	Remove from list		4				4
SSA 19	Beaver Road/Ponds 11 and 12 drainage area and environs	164 acres	No further action		4		4	4	4
CAX Installation Restoration Program Sites									
Site 1	Landfill near incinerator	1.3 acres	Undergoing mediation		4	4			
Site 4	Medical supplies disposal area	unknown	Under investigation		4				

1 = Exclude woody vegetation from capped area
2 = Monitor and correct erosion problems
3 = Maintain access roads to sites/monitoring wells
4 = Eradicate invasive species/monitor native species
5 = Monitor soil fertility/turf; fertilize and seed/plant
6 = Maintain drainage structures
RI = Remedial investigation
Sources: Baker Environmental, Inc. 2002, Wilson 2002

4.3 Grounds Maintenance and Urban Forestry

The primary goals of grounds maintenance and urban forestry are to provide an attractive, well-maintained working and living environment for Station personnel and to protect the real estate value of the Station. The administrative, housing, and recreational areas at WPNSTA are well landscaped with a variety of trees and shrubs, maintained lawns and road shoulders, and interspersed wooded areas. The landscaped trees, shrubs, and wooded areas constitute the Station's urban forest. Care and maintenance of the urban forest is particularly important for the safety of Station personnel and their dependents and the protection of real estate. The Station natural resources staff are the subject matter experts on urban forestry and should be consulted on tree care and maintenance issues. They are required to review new grounds maintenance contracts and oversee tree pruning or removal orders as per the Tree Preservation and Replacement Instruction for Mid-Atlantic Region Navy installations (Draft CNRMA Instruction).

Currently, the Station does not have an urban forest management plan. A plan that assesses urban forest and landscape features and provides guidance for care and maintenance would assist land managers in prioritizing and budgeting tree care work efforts required now and in the future.

A good general reference on urban forest management is the Department of Defense Urban Forestry Manual, which is available at http://www.urbanforestrysouth.org/resources/library/uf-manual-complete/.

4.3.1 Beneficial Landscaping

The 1994 Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds (60 Federal Register 40837) provides the overriding guidance for landscaping requirements on federal properties. EO 13148, Greening the Government through Leadership in Environmental Management, required federal agencies to incorporate beneficial landscaping into landscaping programs, policies, and practices by April 2001. The term beneficial landscaping describes practices that integrate native vegetation and wildlife habitat into the landscape and minimize the adverse effects that landscaping has on the natural environment. In accordance with specific directives of the presidential memorandum and to the extent practicable, federal landscaping projects should comply with the following guidelines:

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

The use of regionally native plant species, which are generally better suited for local site conditions than nonnative species, reduces the need for intensive maintenance and the use of fertilizers and pesticides. Native plant species are also less likely to become invasive pests than nonnative species and serve as better sources of food and cover for native wildlife.

Effective use of native trees and shrubs in landscaping also can provide economic and environmental benefits to the Station. When properly placed around buildings, trees and shrubs reduce energy consumption by moderating the effects of the sun and wind. Planting deciduous trees on the east- and west-facing sides of buildings provides summer shade, and planting evergreens on the north-facing side blocks cold winter winds. Other benefits provided by landscape plants include water conservation and improvement of water quality. These benefits are achieved through reducing the impact of precipitation, reducing flow velocities, and capturing and storing excess runoff. In addition, landscaping with a variety of trees and shrubs provides habitat that attracts wildlife to the urban environment, which benefits both the wildlife and their human observers.

Selecting species that are suitable for a site requires knowledge of plant characteristics such as the species mature size, longevity, tolerance to soil compaction and pollution, and susceptibility to disease and insect pests. A list of plant species native to the Yorktown region and suitable for landscaping purposes is provided in Appendix D. Plant characteristics and site requirements for each species are included in the list. The plant species listed are common commercial plants that may be purchased from the VDOF tree nursery or local nurseries that specialize in native plants. Not all species offered by these nurseries are native, so care must be taken when placing orders.

Due to their aggressive behavior and ability to quickly colonize a site, a number of invasive species are often used for erosion and sediment control. A list of commonly used nonnative plants and recommended native Virginia alternatives is also provided in Appendix D.

Trees, shrubs, and herbaceous species can be purchased from VDOF on its website: http://state.vipnet.org/dof/index.html.

4.3.2 Selection of Plant Materials for Landscaping

The size of plants selected depends on budget, site conditions, planting season, available labor, and desired results. Small bare-root seedlings (whips) or cuttings (live stakes) are available in bulk quantities from the VDOF tree nursery. These seedlings are suitable for large-scale reforestation projects. Because they have relatively undeveloped root systems, bare-root seedlings are likely to dry out in poor, compacted, urban soils and are better suited for less disturbed sites. Container-grown stock is more expensive, but is less susceptible to drying and is better able to compete with surrounding vegetation. Sizes of containers vary from 6-inch tube-grown seedlings (tublings) to large pots or balled and burlapped saplings. Two- to three-gallon container-grown stock is widely available from private nurseries, survives transplanting better than bare-root, and is appropriate for use on a wide range of sites. Areas up to several acres in size can be planted economically with this size planting stock. Large balled and burlapped stock also has a good survival rate after transplanting in poor or compacted urban soils, but is more

costly per plant and is more labor intensive to transport and install than smaller stock. Balled and burlapped stock is most suitable for planting around buildings, along streets, and in high-visibility areas that are required to look good quickly. Planting a mixture of sizes of woody plants is an option that creates more diversity and a more naturalistic appearance.

4.3.3 Planting

The planning process should allow for planting during a suitable season. The type of planting stock used, in part, determines the appropriate time for planting. Bare-root seedlings should be planted in the spring before the emergence of new leaves. Larger woody material is best planted in the late fall after leaves have dropped. At this time transpiration is minimal and root growth increases. Roots are often damaged in the transplanting process; therefore, planting during the fall allows additional time for root development before the summer months when transpiration peaks. Groundcovers can be planted at any time, as long as there is adequate rainfall or available supplemental watering.

Proper tree planting is another vital element of a healthy urban forest. Using correct planting methods can increase a tree's ability to establish quickly and improve its health and longevity. Planting techniques differ somewhat with the type of material planted, though the goal of each is to provide an environment that encourages root growth. Guidelines that apply to most types of planting stock are that the planting hole should be three to five times greater in diameter than the root ball of the material to be planted and only as deep as the root ball. It is important not to bury the roots too deeply or they will not be able to get enough oxygen. Appropriate planting guidelines for various plant materials are presented in Appendix D. Soil amendments should not be added directly to the planting holes for trees and shrubs. These amendments cause problems with soil moisture and root growth. If fertilizers are applied, it is important to use a slow-release product with low solubility so nutrients are not easily leached away. To ensure the greatest chance of survival, urban tree and shrub planting should be performed by trained Station personnel or qualified tree care professionals.

4.3.4 Tree and Shrub Care

The care that newly planted materials receive after planting is critical to their health and longevity. Ensuring adequate soil moisture immediately after planting and during the first two years of establishment is the key factor in planting success. Over watering can deprive the tree of air and should also be avoided.

Preventing damage from mowers and string trimmers is a significant problem for landscape managers. Wounds in a tree's bark make the tree more susceptible to disease and pest infestations and reduce its chance of survival. Mulch can be an effective method of protecting trees from mower damage, when used properly. Mulch protects trees by reducing weed growth around the plant's base, which reduces the need to mow near the plant. Mulch should be applied to a weed-free area around the root mat in a layer about three to four inches thick. Mulch should not be applied too close to the tree trunk or too deeply as this creates an environment that promotes fungal growth and decay.

Placing trunk guards around the base of trees is another method of protecting them from mower damage. However, trunk guards are only suitable for use on small diameter trees and must be removed to prevent tree damage once the tree outgrows the guard.

Annual or periodic maintenance is an important part of keeping the urban forest in good health. Of critical importance is the removal of hazardous trees or branches, which if left unattended could cause damage to persons or property. Other high priority maintenance practices include the removal of large-diameter dead or damaged limbs or limbs infected with disease or pests. Routine maintenance should include removal of small-diameter dead or damaged materials and shaping to avoid future structural problems or conflicts with the surrounding environment. However, each cut has the potential to cause damage to a tree, and therefore, no branch should be removed without a reason. As with planting, pruning should only be performed by qualified tree care professionals or trained personnel.

The natural resources staff are available to conduct training in tree pruning for the Station's First Lieutenant's Division, which provides in-house labor for a portion of the Station's tree care requirements. Appropriate pruning guidelines are presented in Appendix D.

Detailed tree care instructions and a list of certified arborists are available on the International Society of Arborists' website: http://www.isa-arbor.com/.

4.3.5 Reduced Mowing

Another objective of grounds maintenance is to reduce maintenance costs by reducing the amount of mowed area and specialized plantings necessary to accomplish management objectives (DoD Directive 4700.4, Natural Resources Management Program). Routine mowing is required for safety and aesthetic considerations along road shoulders, around buildings, in recreational areas in the administrative and housing areas, and, at WPNSTA, around munitions bunkers in the munitions area. Mowing is also routinely conducted on a number of sites across the installation where buildings or other facilities have been demolished. Because areas of mowed lawn offer few benefits for wildlife, water absorption, soil improvement, or visual interest, removing these sites from routine mowing would provide both environmental and economic benefits to the Station. Allowing these sites to revert to forest through natural regeneration or planting or converting the sites to native warm season grass meadows (discussed below) would increase the environmental benefits to the Station as well as reduce mowing costs.

4.3.6 Native Warm Season Grasses

Converting maintained open areas such as abandoned operational sites and demolition sites, which have no high-level maintenance requirements to native warm season grasses would provide a beneficial alternative to the turf grasses that currently dominate these sites. Widely used turf grasses such as orchard grass (*Dactylis glomerata*), bluegrass (*Poa* spp.), redtop (*Agrostis gigantia*), and tall fescue (*Lolium arundinaceum* [formerly *Festuca arundinacea*]) generally require frequent mowing and use of fertilizers. These species also form dense monocultures that have little wildlife food or cover value.

Native grassland species consist of a number of warm season grasses including big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), eastern gamagrass (*Tripsacum dactyloides*), coastal panic grass (*Panicum amarum amarulum*), switchgrass (*Panicum virgatum*), and broomsedge (*Andropogon virginica*,), along with numerous forb species. The grasses tend to be tall and form persistent clumps that provide year-round habitat for a variety of small mammals and ground-nesting birds. Many of these grass species also produce large seed heads that are eaten by a variety of birds and other wildlife. Besides providing better wildlife cover, native warm season grasses are better suited to the region than introduced cool season grasses because the warm season grasses perform well on the nutrient poor soils of the area, require less water, and can be maintained by infrequent prescribed burns rather than frequent mowing. A number of native grasses, their uses, commercial availability, and characteristics are listed in Appendix D.

Establishing Native Warm Season Grasses. Warm season grasses are slower to establish than nonnative cool season grasses and are less tolerant of weeds and shade. In areas that are being converted from an existing turf grass such as fescue, removal of the existing vegetation is necessary. Either multiple tillings or a combination of tilling and herbicide use may be necessary to eliminate persistent turf grasses. Soil preparation should occur in the spring at least a month before grasses are to be planted. A light surface tilling at seeding time will kill newly emerged weeds and give the new grass an advantage. Phosphorus and potassium fertilizers may be added at the time of planting if soil tests indicate the need, but nitrogen should not be applied. Nitrogen stimulates weeds that could dominate the warm season grass seedlings.

Seeding native warm season grasses is often more difficult than seeding the common cool season grasses. The seeds of little bluestem, Indian grass, and the beardgrasses have tufts of long hair making them difficult to plant with traditional seeders. These seeds should be planted with a specialized warm season grass planter. Switchgrass and coastal panic grass have smooth seeds that can be planted with a regular grass drill. Eastern gamagrass has a large seed and is best planted with a corn planter.

Weeds should be controlled during the first two years after planting. Mowing to a height of eight to ten inches once or twice during the summer may be required. Mowing should not occur after seeds set at the end of August until winter.

Managing Native Warm Season Grasses. On sites where woody vegetation has been eliminated, continued mowing, on a three to four year rotation, will prevent further encroachment. However, mowing alone can create a layer of litter on the ground that prevents new grass seedlings from becoming established. Burning and/or discing the stand every three to four years are methods of removing the litter layer as well as reducing woody growth. On sites where woody vegetation persists, annual treatment may be required to keep the vegetation under control.

Once a stand is established, prescribed burning may be used to maintain and rejuvenate the warm season grasses. Burning portions of the grassland area on a rotational cycle of three to four years assures a distribution of habitat conditions. It also reduces the amount of labor that would be involved with burning the entire area in one season. Prescribed late spring burning can be used to maintain or increase warm season grass biomass and control undesirable cool season grasses.

Cool season grasses are harmed by this treatment because they begin growth early in the spring and are actively growing at the time of burning. Conversely, warm season grasses begin growth in late spring and are thus dormant at the time of burning. Summer fires are most effective in controlling woody vegetation; however, this could conflict with grassland bird management objectives.

A useful guide to managing native warm season grasses is Native Warm Season Grasses for Virginia and North Carolina (Capel 1997).

4.4 Demolition Site Restoration

Due to mission changes and changing infrastructure requirements, a large amount of demolition occurs on an annual basis at the Station. Over 100 buildings and structures were demolished between 1999 and 2002, and an additional 100 or more were scheduled for demolition between 2003 and 2006 (Conlon 2002). Consistent with DoDI 4715.3 and Navy policy, such altered and degraded landscapes and associated habitats must be restored to a natural condition. Post-demolition site conditions must meet basic requirements to ensure site restoration is successful. Basic criteria identified in demolition contracts include the following:

- Remove all related infrastructure, including roads, railways, and utilities, to a depth of three feet below finish grade;
- Remove all rubble and construction debris from the site prior to grading;
- Return the site to a natural grade;
- Provide a minimum of four inches of top soil that is free from debris and stone on sites where top soil has been removed; and,
- Seed the site with a quick-growing, noninvasive cover crop.

After demolition and initial site preparation are complete, sites must be planted or seeded to establish permanent vegetative cover. As with landscaping, the use of native species is required on site restoration projects (OPNAVINST 5090.1B Chapter 3). Sites with long-term maintenance requirements, such as capped landfills, are suitable for conversion to stands of native warm season grasses and native forbs. Sites with no further maintenance requirements are allowed to revert to forest through natural regeneration, though supplemental planting may be used to help ensure successful establishment.

The railroad system at WPNSTA has also been abandoned and is being scheduled for removal. The Station plans to remove the steel rails for reuse or sale, though the ballast will most likely be left in place. Sections of track near buildings and developed areas will continue to be maintained by buildings and road maintenance contracts. The remaining area of the abandoned railway will be allowed to revert to shrub and forest through natural succession.

4.5 Forest Management

The objectives of forest management at the Station are to sustain healthy, forested ecosystems, while supporting the military mission and providing for a range of social, economic, and environmental benefits. Long-term forest management objectives for the Station are to:

- Maintain the health and integrity of forested buffers around all munitions magazines and munitions handling facilities in accordance with mission safety requirements;
- Maintain a diversity of healthy and productive natural forested ecosystems;
- Conserve and enhance the Station's biodiversity;
- Provide for sustained multipurpose uses and provide public access appropriate for those areas to the extent that those uses are consistent with the mission and ecosystem management;
- Protect unique and sensitive natural areas and habitats that are critical to rare, threatened, and endangered species; and,
- Protect soil and water resources.

Although intensive timber production is not a primary objective of forest management at the Station, a limited amount of timber management and harvesting is consistent with natural resources management objectives. Continuing to manage forest stands for high quality timber is a practice that can improve forest health and diversity and provides for multipurpose use of the forested area. Recovering economic value from damaged or dying trees, larger logging slash, or trees of little commercial value through the maintenance of a firewood-cutting program (CNRMA Instruction 5090.900) and from timber cleared for construction projects through timber sales are also consistent with forest management objectives. Converting hardwood-dominated and mixed stands to pine monocultures is not consistent with management objectives and will be avoided.

4.5.1 Forest Inventory

Forest health and productivity are largely assessed by information gathered during periodic forest inventories. A thorough forest inventory typically records physical characteristics such as forest type, age, height, site index for the dominant species, and size class. Size classes are determined by a tree's diameter at breast height (DBH) and may be classified as seedling/sapling (<6 inches), pulpwood (4 to 10 inches, and poor quality trees), chip'n'saw (10 to 12 inches), and sawtimber (>12 inches). These data are used to determine stand density, basal area, annual growth estimates, and timber volume. The forested area is broken into compartments based on geographical areas that have similar operational and mission constraints. These compartments are further divided into forest stands. Criteria for the delineation of forest stands generally include forest cover type, size class, density, and age. Topographic position, operability, presence of rare or unique communities, and environmental and mission constraints are other information used to determine stand boundaries. The most recent forest inventories of the Station were conducted in 1999 for WPNSTA and in 1998 for CAX (Garrison Forest Services, Inc and Geo-Marine, Inc. 1998, Geo-Marine, Inc. and Garrison Forest Services, Inc. 1999). Detailed summaries of forest cover type, size class, timber volume, and stand tally sheets are

provided in the separate forest inventory reports for each installation. Because forests are living, dynamic systems that change both naturally and in response to management activities, complete inventories should be conducted approximately every 10 years to provide accurate up-to-date information.

4.5.2 WPNSTA Forest Resources

The forest inventory at WPNSTA included 7,253 acres of land (approximately 69 percent of the land area). The forested area is divided into 20 forest compartments and 278 forest stands. Forest cover types are described as hardwood (>75 percent hardwood), hardwood-pine (50–75 percent hardwood), pine (>75 percent pine), or pine-hardwood (50–75 percent pine), based on stand volumes. Hardwood forests include both upland hardwood areas and wet bottomland forests. Timber volumes are tallied for red or white oak, which represent the two oak groups, sweetgum, poplar, maple, and miscellaneous hardwoods. Volumes for all pine species are tallied together. Loblolly pine is the most common pine species identified, though some Virginia Pine occurs. Forty-five percent (3,316 acres) of the forested area at WPNSTA is hardwood, 23 percent (1,654 acres) is pine, 18 percent (1,275 acres) is hardwood-pine, and 14 percent (1,008 acres) is pine-hardwood (Figure 4-3).

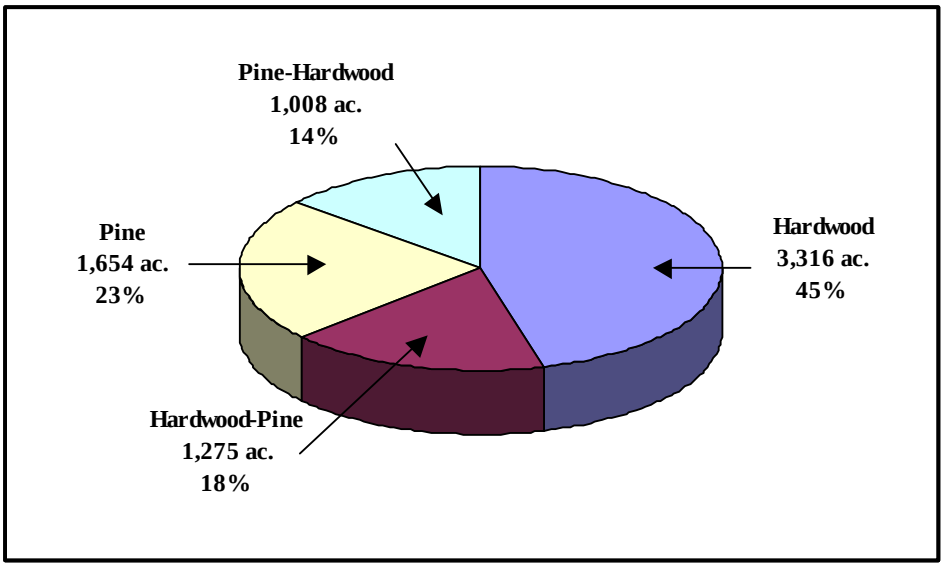


Figure 4-3. Forest Cover Type by Acres at WPNSTA (1999).

Size class (Table 4-2) and age (Table 4-3) are other important stand characteristics that are described in the forest inventory. Hardwood and hardwood-pine stands are nearly all in the sawtimber size category and in the 65–125-year-old age classes, which indicates that little regeneration of these forest cover types has occurred in recent years. A more even distribution across size and age classes occurs for pine and pine-hardwood stands, indicating more regeneration of these cover types has occurred. The largest percentage of pine stands (81 percent), however, is in the 15-year-old age class, which represents the extensive amount of pine regeneration that occurred during the 1970s and 1980s. No forest stands were found to be over 130 years old.

Table 4-2. Acreage by Forest Type and Size Class at WPNSTA (1999).

	Size Class				
Forest Type	**Seedling/Sapling**	**Pulpwood**	**Chip'N'Saw**	**Sawtimber**	**Total**
Hardwood	13			3,303	3,316
Hardwood-Pine	67			1,208	1,275
Pine	927	435	20	272	1,654
Pine-Hardwood	118	56	83	751	1,008
Total	1,125	491	103	5,534	7,253

Table 4-3. Acreage by Forest Type and 10-Year Age Class at WPNSTA (1999).

Age Class*	Hardwood	Hardwood-Pine	Pine	Pine-Hardwood	Total	Percent
5	13	23	144	29	209	3
15		44	1,134	145	1,323	18
25			70	36	106	1
35			44	47	91	1
45	59		9	6	74	1
55				11	11	0
65	195	52	44	53	344	5
75	1,281	351	156	214	2,002	28
85	600	234	38	267	1,139	16
95	543	340	15	62	960	13
105	496	179		74	749	10
115	46	15		40	101	1
125	83	37		24	144	2
Total	3,316	1,275	1,654	1,008	7,253	100
Percent	46	18	23	14	100	

*Age class is midpoint of a 10-year interval and represents the age class recorded during the inventory.

Stocking levels are derived from a stand's basal area (square foot/acre) and number of trees per acre in different diameter classes. These values are provided for each stand in the forest inventory data summary in Appendix E. Stocking charts that are appropriate for the species that occur at WPNSTA are also in Appendix E. Under-stocked or poorly stocked stands are at 10 to 50 percent of their optimal stocking level and are characterized by widely spaced, open grown trees. These stands generally have low value timber but high value for wildlife as a greater variety of herbaceous and shrubby species can fill in under the canopy. Stands that have medium stocking are at 50 to 80 percent of their optimum stocking level and have an intermediate spacing. Stand thinnings and improvement cuts ideally reduce stocking to this level. A fully stocked stand is at least 80 percent of optimum stocking and should have well-spaced, vigorously growing trees. Stands that are overstocked have greater potential to become stressed and are more susceptible to disease and insect infestation. Overstocking is characteristic of pine stands

in the 15- and 25-year-old age classes that have not been thinned since establishment. Poor growth and the threat of southern pine beetle (*Dendroctonus frontalis*) infestation are a concern in these stands. Prior to conducting any stand thinning and improvement cut activities, current stocking levels and desired residual stocking levels should be plotted using stand data and stocking charts provided in Appendix E to determine the appropriate harvest volume.

4.5.3 CAX Forest Resources

The forest inventory at the original CAX parcel included approximately 739 acres of forested land. The collection of forest inventory data for the expansion parcel is planned and will be included the next annual update when available. CAX is divided into four forest compartments and has a total of 38 stands. As with WPNSTA, volumes are tallied for red and white oak, poplar, sweetgum, maple, and miscellaneous hardwood species and all pine species are grouped. Forty-six (46) percent (342 acres) of the forested area is hardwood, 27 percent (201 acres) is pine, 19 percent (138 acres) is hardwood-pine, and 8 percent (55 acres) is pine-hardwood (Figure 4-4).

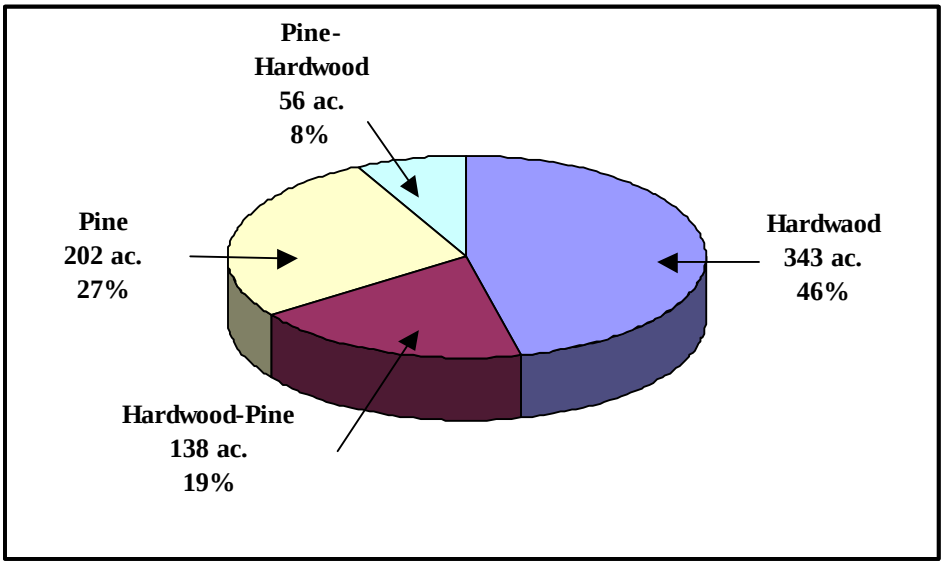


Figure 4-4. Forest Cover Type by Acres at CAX (1998)

Most of the hardwood-dominated stands at CAX are in the sawtimber size class and are in the 45- and 55-year-old age classes (Table 4-4). Very few early regeneration stands and no stands over 90 years old were recorded in the forest inventory. As with the WPNSTA, more intensive management of pine-dominated stands has resulted in a more even distribution of age and size classes. Pine stands occur in each size class and age classes ranging from 15 to 85 years (Table 4-5). Stocking levels at CAX are generally good, though there are a number of pine-dominated stands (i.e., stands 3.10, 3.11, 4.3, 4.4, and 4.9) that are in the overstocked range. As with the overstocked stands at WPNSTA, thinnings should be planned for these stands to improve forest health and wildlife value.

Table 4-4. Acreage by Forest Type and Size Class at CAX (1998).

	Size Class				
Forest Type	**Seedling/Sapling**	**Pulpwood**	**Chip'N'Saw**	**Sawtimber**	**Total**
Hardwood	16			327	343
Hardwood-Pine				138	138
Pine	64	21	19	98	202
Pine-Hardwood		4		51	56
Total	79	25	19	615	739

Table 4-5. Acreage by Forest Type and 10-Year Age Class at CAX (1998).

Age Class*	Hardwood	Hardwood-Pine	Pine	Pine-Hardwood	Total	Percent
5	16				16	2
15			84		84	11
25			26	7	33	4
35	8		31		39	4
45	224				224	30
55	91	55	13	32	190	26
65	4	8		16	28	4
75		75	12		87	12
85			36		36	5
Total	343	138	202	56	739	100
Percent	46	19	27	8	100	

*Age class is midpoint of a 10-year interval and represents age class recorded during the inventory.

4.5.4 Silvicultural Treatments

Silvicultural systems that produce stand structures that approach the complexity and diversity of natural forests are most consistent with the tenets of ecosystem management and forest management goals at the Station. Key elements in developing complex, diverse forests include long rotations; retention of living trees, snags, and cavity trees; and protection from wildfire, insect outbreaks, and disease. Long rotations of at least 120 years for hardwoods and 80 years for pines are needed to develop structural complexity, including large-diameter trees and other old-growth characteristics in managed forests. The retention of living and dead trees of various species, sizes, and ages is also necessary to maintain structurally complex forests and provide refugia for living organisms and biological processes in harvested areas. To optimize ecological benefits, retention trees and snags should occur in aggregated clumps that are distributed over the harvested unit. Structural retention can vary from 10 percent to 70 percent depending on site requirements for regeneration of the desired species. Retention trees should be kept through the subsequent rotation to develop old-growth characteristics. In addition, forest treatments should be aggregated whenever possible to create larger patch sizes and minimize fragmentation. Silvicultural systems of the major forest types found at the Station follows.

Loblolly Pine. Clearcutting and planting is the most commonly used method of regeneration in industrial pine plantations. In this system, one-year-old bare-root or container stock is planted at a rate of 400 to 600 seedlings per acre. The lower densities provide better wildlife habitat because more forage and cover vegetation are able to grow. The advantages of planting are that improved genetic varieties can be used and that the pines get a head start over the hardwoods that are just becoming established after site preparation. Although natural regeneration methods can also produce good results in loblolly pine, without the initial expenses involved in planting, overstocking usually results and additional thinning is required. In clearcuts that rely on natural regeneration from adjacent stands, the cut should not exceed 400 feet in width. In a seed tree system, about 8 to 10 well-formed seed trees, with diameters of 12 inches or greater, per acre are required to establish adequate regeneration. In a shelterwood harvest, about 30 seed trees per acre should be left after harvests to provide a seed source and retard growth of competing hardwoods. Seed trees should be harvested within five years after reproduction has become well established. Seedbed preparation through scarification or prescribed fire can increase seedling germination and success by exposing mineral soils and reducing hardwood competition.

Site quality is a major consideration when planning to regenerate pine stands. Poor growth characteristics occur when loblolly pine is planted on deep dry sands, shallow soils, or extremely wet sites.

Stand thinning is an important management practice in pine stands. Loblolly pine has the unique ability among pines to respond to thinnings throughout much of its rotation period. This characteristic allows for the production of sawtimber even in stands that have been overstocked for much of their life. High value sawtimber, however, can only be produced if an adequate number of good quality stems are present in the initial stand. Besides the benefit of producing larger sawtimber, thinning reduces stress caused by overstocking in a stand. Stress, in turn, makes the stand more susceptible to attack by the southern pine beetle and other pests and diseases. Though stocking tables show somewhat higher volumes as being acceptable, practical experience shows that basal areas greater than 120 square feet per acre in pine stands should be considered overstocked. During the stand rotation, maintaining a basal area of 60 to 80 square feet per acre for poletimber and 80 to 100 square feet for sawtimber would benefit wildlife by allowing for a more diverse herbaceous layer and would help reduce pest infestations. Straight, healthy, vigorous, and evenly spaced trees with live crown-to-stem ratios of 40 to 50 percent should be preserved to the maximum extent possible during thinnings.

Controlling competition from hardwood species is another important silvicultural practice in stands that are managed intensively for pine. As loblolly pine is intolerant to moderately tolerant of shade, young stands may quickly be dominated by more shade-tolerant hardwoods. Understory competition from hardwoods in older stands can also seriously reduce the merchantable volume of pine timber. Prescribed burning is a commonly used method of controlling hardwoods. Once pine saplings are over 15 feet tall, two to three late summer burns or winter burns every three to five years can keep hardwood understories under control. The use of herbicides is an alternative approach that can be used in areas in which fire is precluded for safety.

Mixed Pine-Hardwood. Managing forests for mixed pine and hardwood offers a number of benefits, including timber production, reduced risks from disease and pest infestation, and

valuable wildlife habitat. Mature mixed stands, in particular, have been found to offer both breeding and wintering habitat for a large number of bird species (Kerpez and Stauffer 1989) as well provide the mast (i.e., fleshy fruits, nuts, and acorns) and forage that are necessary for the survival of deer and other wildlife species (Wigley et al. 1989). Mixed forests can be considered transitional between pine and various hardwood types and, in the absence of disturbance, succession will strongly be towards the hardwoods. Site index and hydrologic regime strongly influence the hardwood component of a stand. On moist sites, sweetgum, red maple, and tulip poplar colonize the site along with loblolly pine. In these stands, hardwoods grow quickly and form a single stratum canopy with the pines. On drier sites, several oak species, including southern red oak and white oak, may invade areas that were first colonized by pines and over a long period of time become their canopy codominants.

Stands with high percentages of sweetgum and red maple are generally considered to have lower timber and wildlife value than stands with a mix of oak species. Stand treatments to reduce competition and ensure oak regeneration include prescribed burns and selectively thinning the undesirable species.

Natural regeneration should be used for regenerating this forest type. Group selection in openings that are two to three times the height of the bordering trees is recommended for maintaining this forest type. To maintain or increase the oak component, advanced regeneration is necessary prior to harvest. If advanced regeneration is inadequate, the release of several prime seed trees per acre may be necessary.

Hardwood. Most of the hardwood-dominated forest at the Station occurs on steep slopes and in wet bottomlands; therefore, intensive forest management would not be consistent with the Station's forest management objectives. However, silvicultural treatments that increase the hardwood component in poorly stocked or low quality stands or that establish hardwoods on previously disturbed sites are forest management actions that will be considered.

Hardwood reproduction on forested sites is best accomplished through natural regeneration (i.e., seed, stump sprouts, and advanced reproduction). The presence of an adequate number of seedlings on a site is particularly important. Steps to promote advanced regeneration include increasing light to the forest floor through understory removals and partial overstory cuttings. A stocking level of at least 150 free-to-grow oaks per acre should be present prior to overstory removal. Supplemental planting or direct seeding can be used to bolster stocking levels. If direct seeding is used, openings should be greater than 100 feet on a side to minimize rodent damage. Harvesting in two-acre units should be used to release advanced regeneration and/or stump sprouts. Intermediate thinning may be conducted to favor the oak component.

Hardwood establishment for restoration of disturbed sites requires soil treatments such as discing or sub-soiling, addition of soil amendments, and weed control. Turf-forming grasses, in particular, need to be controlled through mechanical or chemical means. Planting or direct seeding may be used, though planting gives seedlings a greater advantage over the competing vegetation. When seedlings are used, a root collar diameter of three-eighths-inch is recommended. The most consistent success in hardwood planting has been through the use of tree shelters, stakes, and grass mats. Four-foot tree shelters must be installed at least one inch

below the ground surface and tied securely to a one inch by one inch hardwood stake. Bamboo stakes may be used but must be at least three-fourths-inch diameter at the small end.

VDOF offers advice for planting hardwoods on their website:
http://state.vipnet.org/dof/mgt/hwd-planting-guide.htm.

4.5.5 Insect and Disease Control in Forest Stands

Through a memorandum of agreement (MOA) on Forest Pest Suppression on DoD Lands, the USFS provides technical assistance, information, and training opportunities to DoD personnel for the protection and suppression of forest insects and diseases. During periods of pest infestations or disease outbreaks, Station natural resources personnel coordinate with the USFS to monitor pest populations and forest conditions. The most significant potential forest insect and disease problems at the Station and silvicultural treatments are described below.

Southern Pine Beetle. Southern pine beetle is the major forest insect pest problem of loblolly pine on the Station. Southern pine beetle and other bark beetles, however, are actually a symptom of a forest that is already under stress. Because the beetles are always present throughout the forest at low (endemic) levels, they can explode into a major outbreak (epidemic) when conditions are favorable. Most infestations originate in stands that are under stress due to:

- Prolonged moisture or drought conditions;
- Nutrient-poor soils;
- Mechanical damage to trees during harvest operations; or,
- Overstocking (stands with basal areas of greater than 120 square feet per acre are considered at high risk for southern pine beetle attack).

Early symptoms of a southern pine beetle infestation are the appearance of multiple pitch tubes or masses of resin and reddish boring dust marking the beetles' entrance. Tree foliage changes from yellow to brown over the course of one or two months and eventually falls as the tree dies.

Preventive measures include avoiding planting offsite, maintaining vigorous stands through thinning before they become overcrowded, and harvesting trees at maturity. The prompt salvage and utilization of infested trees, including a 40-foot buffer strip of green trees in advance of the beetle spot, is the best method of preventing additional tree loss. If trees cannot be salvaged, piling and burning or cutting and leaving infested materials will also help stop the spread of the infestation. If trees are to be cut and left on site, infested trees and an additional buffer of uninfested (green) trees should be felled toward the center of the infestation. To quicken the drying process and help eliminate the beetle, felled trees should be cut into four to five-foot sections.

Recent research has shown that the use of inhibitory compounds and attractants (Goyer et al. 1998) can also be effective in the control of the southern pine beetle. Because of the expense

involved, the use of chemical treatments would only be warranted at the Station in urban or high visibility areas where tree damage and tree replacement costs would be high.

Ips Engraver Beetle (*Ips avulsus*). The ips engraver beetle is another serious pest to pine stands in the South. Ips beetles are attracted to injured, dying, or recently felled trees and fresh logging debris from which they can then infest weakened or stressed trees. The best control is prompt removal and utilization of infested trees, the destruction of the bark and slabs, and the removal of slash material greater than four inches in diameter from logging sites. In addition, forest operations should be scheduled during late summer and fall to avoid producing fresh slash when beetles are emerging.

Regeneration Weevils. Regeneration weevils including the pales weevil (*Hylobius pales*) and pitch-eating weevil (*Pachylobius picivorus*) are the most serious insect pests of pine seedlings in the Eastern United States. Adult weevils are attracted to freshly harvested pine stands where they breed in stumps and old root systems. Seedlings planted in freshly cut areas are injured or killed by adult weevils that feed on the stem bark. All conifer species and some hardwoods are susceptible to regeneration weevils.

The appearance of chewed or girdled stems or twigs in the spring and fall is evidence of infestation. When feeding is light, small isolated patches of bark are removed. Dried resin on the stem gives the seedling a sugary appearance. When feeding is heavy, large patches of bark are removed, which may girdle and kill the seedling. Feeding injury may also occur underground. Saplings and larger trees may also be attacked, but feeding is restricted to the bark on twigs near the ends of branches. This type of injury is common on trees near harvested areas.

Pine stands regenerated by direct seeding or natural regeneration are less susceptible to attack because the weevils usually leave the area before the seedlings are large enough to be fed upon. Two effective control measures in planted stands are: (1) delaying planting for one year after harvest or (2) treating seedlings with insecticide before or after planting. Delaying planting is more consistent with the Navy's policy on IPM.

Annosus Root Rot (*Heterobasidion annosus*). The major disease in pines is annosus root rot, which attacks trees after stand-thinning operations. With this disease, trees begin to die in the second or third season after thinning and losses continue for several years. High hazard sites are sites that have deep sandy soils with low organic matter. Prescribed burning before and after thinnings, reducing the number of thinnings, and dusting stumps with borax are methods that may be used to reduce infections.

Asian and European Gypsy Moth (*Lymantria dispar*). The gypsy moth is a native of Europe, Asia, and northern Africa that was accidentally released in the United States over 130 years ago and has since spread into the mid-Atlantic and Midwestern states. Most of the gypsy moths in North America are of European origin. However, in recent years, there have been several accidental introductions of Asian populations. Though the Asian gypsy moth is the same species as that from Europe, there are two important differences in the biology of the two strains: the female Asian gypsy moth can fly up to 25 miles and the larvae eat conifers as well as hardwoods; whereas, the female of the European strain is flightless and the larvae primarily eat hardwoods. Because the Asian females are capable of flight, there is considerable concern that this gypsy

moth could quickly spread throughout North America. York County is within a portion of Virginia considered to be infested with European gypsy moths since 1998; however, no defoliation has been recorded for the county (Roberts 2002).

Asian Long-Horned Beetle (*Anoplophora glabripennis*). A new pest of hardwoods, the Asian long-horned beetle has recently been reported in 14 states, but is only known to have established populations in New York and Illinois. Maples seem to be a preferred species of the Asian long-horned beetle, which could be a significant problem in coastal plain hardwood forests where red maple is one of the primary species. Signs of this beetle are the appearance of large boreholes and sawdust at points where adults leave the tree and smaller oval wounds in the bark where females chew out a place to lay their eggs. The adult beetle is large-bodied with black-and-white coloration and long black-and-white antennae.

Emerald Ash Borer (*Agrilus planipennis*). A beetle from Asia, the emerald ash borer, was identified in July 2002, as the cause of widespread ash (*Fraxinus* spp.) tree decline and mortality in southeastern Michigan and Windsor, Ontario, Canada (USDA 2008). Larval feeding disrupts the transport of nutrients and water and eventually causes branches to systematically die, ultimately killing the tree. It is estimated that tens of millions of ash trees in forest, rural, and urban areas have already been killed or are infested (USDA 2008). Although much of the infestation has been restricted to the Midwest, it was first detected in Virginia 2003 in Fairfax County. Although this population was considered to be eradicated, a reoccurrence was detected in Fairfax County in 2008. The inadvertent transportation of infested ash nursery stock, unprocessed logs, firewood, and other ash commodities is listed as the primary cause of infestation and state quarantines now regulate the transport of these products. In Virginia, the movement of these products is restricted by quarantines for Fairfax, Arlington, Fauquier, Loudoun and Prince William counties and the cities of Alexandria, Fairfax City, Falls Church, Manassas and Manassas Park. The spread and control of the emerald ash borer in Virginia should be closely monitored by Station personnel so management actions may be taken.

Miscellaneous Insect Pests and Diseases in Hardwoods. Insect pests and diseases in hardwood forests have not caused the significant losses in the coastal plain region as elsewhere in the nation. Eastern tent caterpillar (*Malacosoma americanum*), forest tent caterpillar (*Malacosoma disstria*), and fall webworm (*Hyphantria cunea*) are common pests of hardwood species; however, they do not generally cause mortality and are more of an aesthetic issue than forest health issue. Forest pests that can cause forest health problems include sycamore anthracnose (caused by the fungus *Gnomonia platani*) and dogwood anthracnose (caused by several fungal agents). To date, these organisms have not been a problem on the Peninsula but should be watched for, as they are able to cause severe damage to shade and forest trees.

Current forest pest information is available on the VDOF website:
http://www.dof.virginia.gov/health/index.shtml or
the USFS website: http://www.na.fs.fed.us/pubs/palerts.shtm.

4.5.6 Water Quality and Wetlands Protection

Forestry operations, like any ground-disturbing activity, have the potential to impact water quality and wetlands if not planned and executed carefully using state-approved BMPs. BMPs designed to minimize impacts of timber harvesting and other forest management activities on soil and water resources are described in Virginia's Forestry Best Management Practices for Water Quality in Virginia (VDOF 2002a). Because wetlands are extremely sensitive and are most valuable as functioning ecosystems when left undisturbed, it is generally not expected that forestry operations will be conducted in this habitat type at the Station. However, if harvesting becomes unavoidable because of mission or safety requirements, special precautions must be taken to protect water quality and avoid the deposition of logging debris, soil, or any other material in streams, wetlands, or other bodies of water.

The Virginia Department of Forestry
Best Management Practices (BMP) Guide is available on the VDOF website:
http://www.dof.virginia.gov/wq/index-BMP-Guide.shtml.

Section 404 of the CWA affords an exemption for normal and established silvicultural activities in wetlands as long as state BMPs are implemented. Normal silvicultural practices covered by the silvicultural exemption include planting, seeding, cultivating, minor drainage, and harvesting. The silvicultural exemption does not include land-recontouring activities such as grading, land leveling, filling in low spots, or conversion to upland. Construction and maintenance of forest roads are exempt if the work is done in accordance with state-approved voluntary BMPs and mandatory BMPs for road construction and maintenance. Silvicultural activities that do not result in the permanent change in land use are also exempt from the Chesapeake Bay Preservation Act and Virginia Erosion and Sediment Control Law as long as BMPs are implemented. However, to comply with buffer area requirements of the Chesapeake Bay Preservation Act, revegetation and site stabilization must occur within the entire 100-foot buffer area adjacent to perennial streams and wetlands once silvicultural operations are complete. The revegetation procedure is to be detailed in a written plan and submitted to the local government.

4.5.7 Forest Administration

Annual work plans by forest compartment and stand serve as the basis for funding authorizations and progress evaluations by natural resource managers. Data on costs, timber harvest volumes, reforestation, existing conditions, and other pertinent information are kept current and available on file for review. NAVFAC Atlantic and state foresters are often consulted for guidance and assistance in planning and implementing this forest management program. Timber sales are conducted in coordination with Station personnel responsible for preparing contract specifications, obtaining bids, and helping to guide harvesting operations. Harvesting firewood in designated areas on the Station for timber salvage is an appropriate use.

Routine forest maintenance practices such as thinning, sanitation cuts, and harvests under one million board feet are consistent with practices described in this INRMP and will not require further NEPA documentation. Harvests greater than one million board feet are not within the scope of this plan and would likely require an EA.

4.6 Fish and Wildlife Management

An important function of the natural resources program is to maintain and enhance habitats to support a full spectrum of native wildlife species, including fish, birds, mammals, herpetofauna, and invertebrates. The Station's basic objectives of fish and wildlife management include the following:

- Manage fish and wildlife species and their habitats within the constraints of the military mission;
- Conserve and promote conservation of game and nongame fish and wildlife and their habitats, particularly habitats of state- or federal-listed rare, threatened, or endangered species;
- Balance wildlife population levels with habitat carrying capacity; and,
- Provide recreational opportunities for Station personnel and their dependents and community members.

Wildlife management tools available to natural resources managers to accomplish these objectives include habitat and population management. Types of habitat management actions undertaken at the Station include: forestry management practices that create complex stands with high species and structural diversity, maintenance of areas of early successional habitat such as fields of native warm season grasses, and creation and maintenance of a limited number of wildlife food and cover plots. Mowing, prescribed fire, planting and seeding, and timber harvest are all tools used to achieve desired habitat conditions. Hunting and fishing are direct forms of population management currently allowed at WPNSTA and CAX. The controlled harvest of species such as white-tailed deer is a particularly important management tool. Hunting also provides outdoor recreational opportunities for Station personnel and surrounding community. Although not a current program at the Station, fish stocking has occurred at several ponds, and may be considered as a future management option.

4.6.1 Game Species

Game species at WPNSTA and CAX include a variety of small mammals, furbearers, birds, and white-tailed deer. The most frequently hunted game species at the Station are white-tailed deer, eastern wild turkey, gray squirrel, and eastern cottontail. Other game species that occur at the Station, but are not intensely hunted, are mourning dove, American woodcock, raccoon, opossum, red fox, and gray fox. Waterfowl hunting is not allowed on Station lands and waters. Habitat requirements and management of the major game species are discussed below.

White-Tailed Deer. White-tailed deer are a generalist species that occupy nearly every habitat type at the Station. Deer are most active during the diurnal and nocturnal periods of the day, utilizing forested areas for cover throughout much of the day, then moving towards more open habitats such as mowed areas, open fields, and residential portions of the Station to feed. Though nearly extirpated from the state in the early 1900s, white-tailed deer populations have rebounded and are at or exceed biological carrying capacity in most counties in Virginia. In areas with particularly high deer populations, deer browsing can degrade natural ecosystems by inhibiting regeneration of native species, thereby restricting biodiversity within forest

understories. They can also cause damage to gardens, crops, and ornamental plantings and are often involved in vehicular accidents.

Although deer populations are high in many areas of the State, the deer population at the Station is controlled through a regulated hunting program and is not considered problematic. The Station participates in the VDGIF Deer Management Assistance Program (DMAP). DMAP is a site-specific management program that allows a more liberal harvest of antlerless deer to better manage the deer population. DMAP tags may only be used to harvest antlerless deer and management objectives are adjusted (e.g., total tags issued) based on annual harvest data. The current management objective for York County is to reduce the deer population (VDGIF 2007); therefore, annual hunting seasons and bag limits are set high to help achieve management objectives.

Virginia Department of Game and Inland Fisheries Virginia Deer Management Plan 2006-2015 is available on the VDGIF website:
http://www.dgif.virginia.gov/wildlife/deer/management-plan/

Harvest data from previous years is used to characterize the overall deer population and health so harvest and season restrictions can be set for upcoming hunting seasons. These data include biological data such as sex, age, weight, antler development, information on lactation, and hoof condition (used as an indicator of disease), as well as data on hunter density (hunter-days), permit types, road kill count, and previous seasons timing, length, and type (e.g., fall and winter archery, muzzleloader). Because annual deer populations may vary widely due to a variety of factors (e.g., weather, food availability, population density), at least three to five years of data are needed to discern population and harvest trends. Harvest data collected for WPNSTA and CAX are maintained by natural resources staff and submitted to the state annually. The state summarizes these data and provides an annual report to the Station so achievements can be assessed and management objectives can be developed.

The total deer harvest at WPNSTA ranged from 184 in 2002 to 246 in 1997 and from 19 in 2002 to 71 in 2008 at CAX (Table 4-6). Over the 12 hunting seasons, male deer accounted for 56 percent, and females accounted for 44 percent of animals harvested at WPNSTA and male deer accounted for 63 percent and females accounted for 37 percent of the deer harvested at CAX (Table 4-6). The number of female deer harvested relative to the male harvest (harvest sex ratio) is an important index for determining if management objectives are being achieved. To maintain a stable deer population, the female harvest should be 30 to 40 percent of the total harvest. If the management objective is to reduce the deer density, the female harvest should exceed the male harvest. The average female harvest from 1997 to 2008 was approximately 44 percent, which is consistent with the objective of maintaining a stable deer population at the Station. A decrease in harvest trend, however, could indicate a decline in the population, as there is no evidence of a decrease in hunting pressure during the survey period. The number of permits sold increased from 200 in 1997 to 350 in 2001. Raw deer harvest data from 1997 to 2008 are available for WPNSTA and are provided in Appendix F.

Age distribution is a summary of deer age classes (e.g., fawns, yearlings) recorded for each of the hunting seasons and are often determined from an analysis of tooth wear and replacement of

harvested animals. The age distribution can provide insight into the previous years recruitment and the survivorship of older age classes. Deer harvested during the 1997–2001 hunting seasons for the Station, when this type of data was collected, found yearlings and fawns accounted for 65 percent of the harvest. A low percentage (i.e., 15 percent) of harvested deer were older than 3.5 years.

Table 4-6. WPNSTA and CAX Deer Harvest Summary (1997-2008).

Year	Male Fawns	Antlered Males[1]	Females	Total	% Females in Harvest
WPNSTA					
1997	64	112	170	346	49
1998	36	99	99	234	42
1999	38	91	124	253	49
2000	40	98	104	242	43
2001	33	104	78	215	36
2002	N/A	87	97	184	53
2003	N/A	143	92	235	39
2004	N/A	154	98	252	39
2005	N/A	113	84	197	42
2006	N/A	145	128	273	47
2007	N/A	133	112	245	46
2008	N/A	166	141	307	46
Total	211	1445	1327	2983	44
% of Total	56		44		
CAX					
2002	N/A	15	4	19	27
2003	N/A	31	12	43	27
2004	N/A	40	15	55	37
2005	N/A	25	28	53	53
2006	N/A	37	28	65	43
2007	N/A	40	18	58	31
2008	N/A	40	31	71	44
Total	N/A	228	136	364	37
% of Total		63	37		

[1]Between 2002 and 2008 “button bucks” or male fawns were counted as antlered deer

The fawn per doe harvest ratio (FDR) is a relative index of the past year's recruitment or reproduction. The FDR is the number of fawns (male and female) divided by the number of yearling (1.5 years old) and adult (>1.5 years old) females harvested. A similar index, the number of fawns per antlerless harvest (number of fawns divided by the total number of antlerless deer harvested), also provides a useful approximation of the past year's recruitment or reproduction. Healthy, reproductive deer herds have an FDR that equals or exceeds 1.0 and equals or exceeds 50 percent in the antlerless harvest. A FDR of 1.0 and the percent of fawns in

the antlerless harvest of 50 percent recorded for the 1997–2001 deer seasons indicated high recruitment at WPNSTA each year.

The average annual reduction rate for males (AARR-M) is the percentage of yearling males in the antlered male harvest. High AARR-M rates (>60 to 70 percent) are characteristic of a young antlered male age structure and high harvest pressure on the antlered segment of the population, with few males surviving to the older age classes (3.5 years old). Low rates (<30 to 40 percent) are representative of an older antlered male age structure and low hunting pressure on the antlered segment of the population as more males have an opportunity to reach the older age classes and exhibit large body size and antler development. The AARR-M can also be used as an index of the antlered male harvest per mortality rate (i.e., 60 percent AARR-M indicates that hunting mortality for antlered males is 60 percent). The AARR-M of 62 percent at WPNSTA recorded during the 1997–2001 hunting seasons indicates a young antlered male age structure and high harvest pressure on the antlered segment of the population.

The average annual reduction rate for females (AARR-F) is the number of yearling females harvested divided by the total number of yearling and adult females harvested. Low hunting pressure on females is indicated by an AARR-F below 20 percent, moderate hunting pressure is indicated by an AARR-F of 20 to 30 percent, and high hunting pressure is indicated by an AARR-F of 35 to 40 percent. The average AARR-F of 36 percent at WPNSTA recorded during the 1997–2001 hunting seasons indicates high harvest pressure on the female segment of the population.

Records of average dressed weight and antler measurements provide useful indices of the deer herd condition and are useful for identifying changes in population size and habitat conditions. The average dressed weight and antler characteristics for the yearling male age class is important in interpreting the balance between deer population size and habitat conditions because this age class typically contains the majority of antlered males harvested and is most affected by changes in population size and carrying capacity. In healthy productive deer herds in the Tidewater region, yearling males have average dressed weights of 85 to 90 pounds, four to six antler points, and an average beam diameter 17 to 19 millimeters (mm) (VDGIF 1999). Yearling males at WPNSTA, on average, were considerably smaller (69 pounds), had fewer antler points (2.9), and had smaller beam diameters (16.5 mm) when data was recorded for the 1997–2001 hunting seasons.

The percent of yearling males that are spike-antlered is another good indicator of herd health. As a general rule, as deer density increases, deer condition declines and the percentage of yearling males with spike antlers increases. The percentage of spikes in the yearling male harvest ranges from less than 30 percent in the best herds to greater than 50 percent in the poorest herds. More than 61 percent of the yearling males at WPNSTA were spike-antlered during the 1997-2001 hunting seasons. Average lactation rates also provide useful indices of the deer herd conditions. In healthy deer herds, lactation rates in adult females (>1.5 years old) should be 60 to 70 percent. Lactation rate in yearling females (evidence of fawn breeding) indicates a healthy, productive herd and is usually 20 percent or less in most herds. The lactation rate in yearling females at WPNSTA was over 42 percent during the 1997–2001 hunting seasons.

Analysis of the 1997–2001 hunting season harvest data indicate the deer herd at WPNSTA has a young age structure and exhibits high hunting pressure on each segment of the population. The herd has high reproduction and recruitment rates. The number of antler points and weight data, however, indicate that harvested deer are in below average condition for the region and may indicate a stressed population. Although the Station attempts to control its deer population, deer under population pressures are often moving into WPNSTA and CAX from the surrounding NPS and residential areas that are not hunted. The resulting competition for resources increases stress and reduces herd health on the Station.

A major health problem associated with poor herd health is an increase in parasitism and incidence of disease in the deer herd. Of particular concern are two closely related viruses, the epizootic hemorrhagic disease virus and the bluetongue virus, which are collectively referred to as hemorrhagic disease (HD). HD is one of the most important infectious diseases of white-tailed deer and outbreaks are seen almost every year somewhere in the United States. It is not transmissible to humans. Hoof sloughing and splitting are symptoms of HD that are recorded for each deer harvested at WPNSTA. An average of 0.8 percent of the harvested deer (10 deer in 1998 and 1999) had symptoms of HD.

The majority of the indices above were collected during the 1997–2001 hunting seasons and have not been collected since. The collection of these data during this brief period has provided valuable insight into the health and status of the Station's deer population and has allowed for a well managed deer herd. As funding allows, collection of these data should be renewed to gain a more current understanding of the Station's deer herd.

Wild Turkey. Statewide, the wild turkey population increased at an annual rate of approximately 6.5 percent between 1990 and 2000 and is at record high levels for modern times. The Tidewater region has one of the highest densities of wild turkey in the state, based upon spring harvest counts, with approximately 0.74 birds harvested per square mile of forest range (Norman 2001). Limited wild turkey data are available for the Station, with a total of 24 birds harvested from the fall of 2006 to spring 2007. However, the abundance of mature hardwood forests and other preferred habitat types should support a robust population. Collection of annual harvest data including age and sex would provide valuable population information that is relatively easy to collect. Indices similar to those used to estimate deer recruitment and population may be used to assess the Station wild turkey population.

Adult turkey preferred foods include acorns, wild grapes, flowering dogwood, American beautyberry, and blackberry, whereas poults eat a large number of insects and often require grassy open areas for foraging. To meet feeding and nesting needs, optimal turkey habitat is often characterized as large tracts of mature hardwood forest interspersed with small early successional patches. Large stands of pure pine do not provide sufficient year-round food to support turkeys. Thinned pine stands with abundant ground cover, however, can provide nesting habitat, and young stands can provide temporary early successional habitat for nesting. Maintained open areas that include a mix of native warm season grasses, forbs, and shrub species also provide nesting and foraging habitat. Open fields that are dominated by tall fescue (*Festuca elatior*), a commonly used turf species, do not provide quality turkey habitat.

Eastern Cottontail. The eastern cottontail is another habitat generalist that thrives in a variety of disturbed early successional habitats and is relatively abundant at the Station. Typical foods consist of almost any type of herbaceous vegetation, buds, and twigs. Thickets, brush piles, and unmowed grass provide important escape cover during the day, while open fields and mowed roadsides are important for nocturnal feeding. Large forested areas are generally unsuitable habitat. Although many of the Station lands are forested, it is well interspersed with maintained open areas (i.e., magazines, roadsides, wildlife food and cover plots, abandoned railroad rights-of-way, and other abandoned operational areas), which provide abundant early successional habitat. Hedgerows and other woody thickets are, in places, the only missing components for optimal cottontail habitat. The Station participates in an annual cottontail survey sponsored by VDGIF. Though no trends in rabbit populations are evident in the data, counts range from a high of 39 rabbits in 1989 to a low of three rabbits in 1998 for the WPNSTA. Cottontail survey route and data are included in Appendix F. Although surveys are not conducted at CAX, cottontail populations are likely to be concentrated at the golf course and developed areas where hedgerows and overgrown brushy areas abut open fields and mowed lawns.

Northern Bobwhite Quail. The bobwhite is a species that primarily uses habitat edges and early successional plant communities. Nesting cover for quail is best provided by warm season grass clumps left from the previous growing season. Interspersion of cover types, including sparse ground cover and brushy thickets for escape cover, is an extremely important feature of good quail habitat. The diet of adults consists of seeds and fruits of cultivated crops, wild herbaceous plants, and woody plants. Insects are the primary food for quail during the first few weeks of life. As with wild turkey, a dense cover of tall fescue does not provide suitable quail habitat. Increasing the amount of open area maintained in a mix of native warm season grasses and legumes and reducing mowing of utility rights-of-way and road shoulders to an annual winter mowing schedule are habitat manipulations used for improving quail habitat on the Station.

WPNSTA participates in an annual VDGIF quail call survey, which contributes to the understanding of the state population. These data indicate the highest number of quail were heard calling during the period from 1988 to 1992 (an average of 9.4 per year) and have been much lower since then (an average of 2.1 per year). To improve the meaningfulness of the data for WPNSTA, however, the route should be run four to five times during the month of June each year. Quail survey route and data for this time are provided in Appendix F.

4.6.2 Wildlife Food and Cover Plots

Approximately 44 acres at WPNSTA and 2 acres at CAX are managed as wildlife food and cover plots for game and nongame species (Figures 4-5 and 4-6). Portions of the plots are planted with crop species such as orchard grass (*Dactylis glomerata*), ladino clover (*Trifolium* spp.), and small grains such as winter wheat (*Tritcum* spp.), barley (*Hordeum vulgare*) or winter rye (*Secale cereale*), which provide high quality winter grazing for wildlife. Portions of the plots are left unmowed to provide escape and nesting cover. No more than two-thirds of the wildlife cover plot acreage is mowed annually during the winter to maintain a variety of early successional habitat. An alternative to planting nonnative species, which generally require supplemental fertilizers and lime to remain productive, would be to maintain the areas in an early

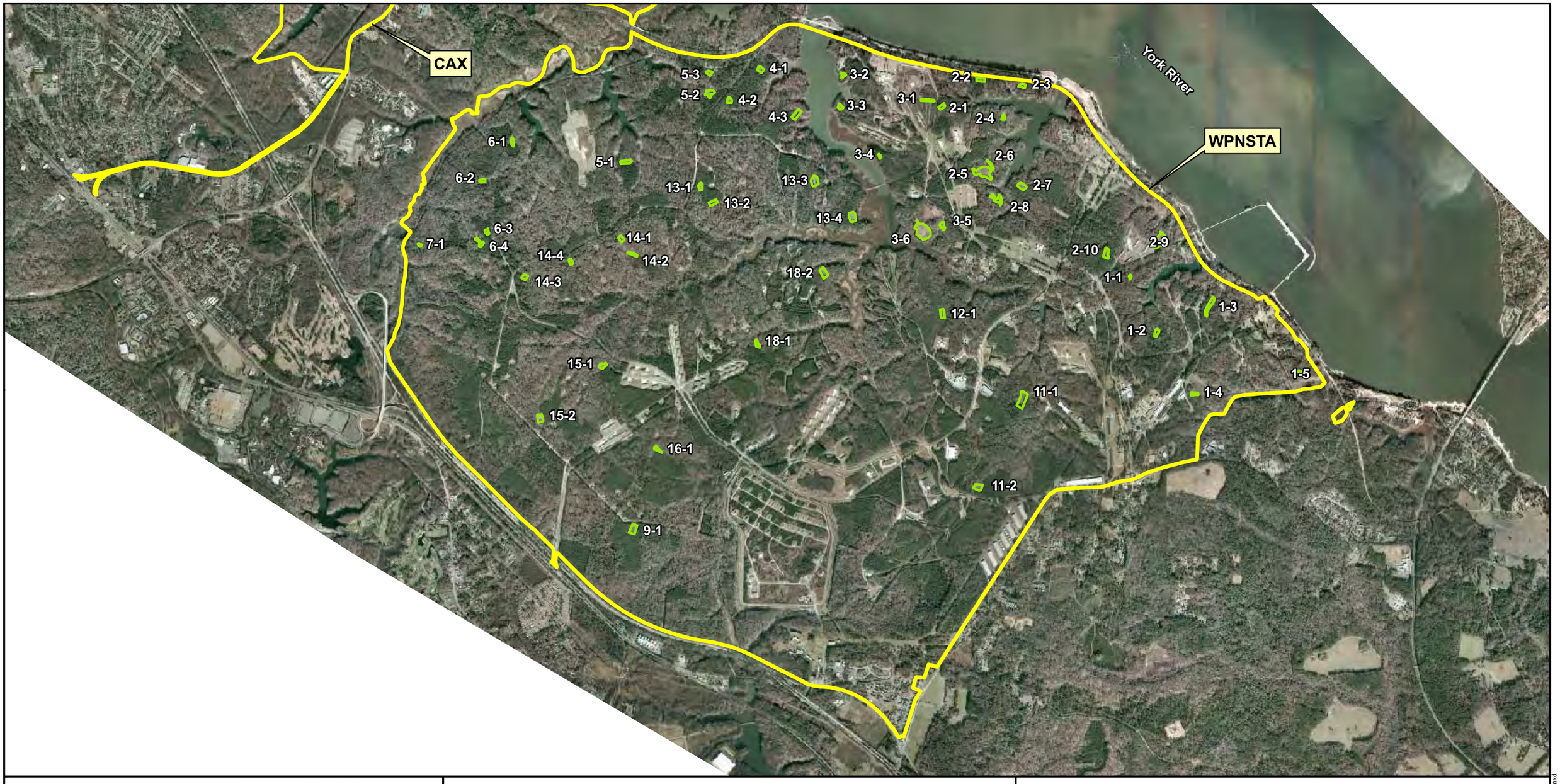


Figure 4-5. Wildlife Food Plots at WPNSTA.

Prepared For: NAVFAC Naval Facilities Engineering Command	
Prepared By: TETRA TECH	**Date:** 04/2010

P:\GIS Projects\NAVFAC\MXD\Report\Figure3-5WaterResources.mxd

Legend

- Installation Areas
- Wildlife Food Plots

Source: U.S. Navy 2009.

0 750 1,500 Feet

0 180 360 Meters

N

Figure 4-6. Wildlife Food Plots at CAX.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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successional community through discing, mowing, or prescribed burning. These practices would release native food and cover plants that could benefit a range of native wildlife species.

4.6.3 Nongame Wildlife

Nongame wildlife includes all wildlife species that have no established hunting season. Fish and wildlife habitat management objectives for nongame species are primarily met through effective wildlife management focusing on biodiversity and the promotion of native vegetation and wildlife. Maintaining or enhancing the quality, integrity, and connectivity of habitats at the Station and the surrounding land areas is the most effective way to sustain a wide range of native wildlife species. In instances where a species is rare or known to be in decline, specific management actions may be implemented to enhance food or habitat availability for the target species. Habitat requirements and management of several wildlife groups and species guilds are discussed below.

Migratory Birds. Migratory birds are a large, diverse group of birds that utilize breeding grounds in the United States and Canada, and overwinter in southern North America, Central and South America, the West Indies, and the Caribbean. All migratory birds are protected under the Migratory Bird Treaty Act (MBTA), 16 USC §703-711 and EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, provides additional protection for migratory birds on federal properties. EO 13186 stresses the incorporation of bird conservation principles in agency management plans.

In accordance with this EO, natural resources management at the Station supports conservation objectives identified by Partners in Flight (PIF). PIF is an international consortium of state, federal, and private organizations dedicated to the conservation and management of migratory landbirds and their habitats. DoD is a key partner in the program due to the vast amount of undeveloped areas managed by DoD across several regions. PIF identifies priority bird species and habitats most in need of conservation and outlines conservation objectives in its *Bird Conservation Plan for the Mid-Atlantic Coastal Plain* (Watts 1999). Several of the plan's priority species have been identified during Station surveys, including the prothonotary warbler, Acadian flycatcher, wood thrush, and worm eating warbler (GMI 2002, Tetra Tech 2009). A complete list of avian species found at WPNSTA and CAX can be found in Appendix C. All but one of the habitat types known to support these priority species and identified in the conservation plan occur at the Station. Using the PIF plan as a guide, the following conservation objectives were developed for the Station to enhance migratory bird habitat:

- Identify and maintain significant blocks of mixed upland forest and consider the value of hardwood-dominated forests in management decisions;
- Prevent any loss of forested wetlands;
- Avoid converting mixed forests or hardwood-dominated forests to pine monocultures;
- Use open spacing for planting and conduct multiple thinning in pine plantations to delay canopy closure and promote understory vegetation;

- Shift management of early successional habitats greater than 20 acres to grassland and smaller early successional parcels to shrubland; and,
- Monitor and control infestations of common reed in salt, freshwater, and brackish marshes and identify sensitive habitats in oil spill response plans.

The DoD Partners In Flight website has links to the Bird Conservation Plan for the Mid-Atlantic Coastal Plain and other bird conservation information: http://www.dodpif.org.

Developing an agreement with PIF to manage appropriate grassland areas for specific bird species such as Grasshopper Sparrow (*Ammodramus savannarum*) or Henslow's Sparrow (*Ammodramus henslowii*) would help meet regional management goals for these high priority species.

A recent effort by the USFWS further identified migratory and nonmigratory bird species that are not currently designated as federally threatened or endangered, but are a high priority for conservation. Species listed by the USFWS are those that, without additional conservation actions, are likely to become candidates for listing under the ESA.

Artificial Nest Boxes. Artificial nest boxes are useful for enhancing habitat conditions for a number of bird and wildlife species in areas where there are few natural cavity trees or where competition from aggressive nonnative species such as house sparrows and European starlings is great. Placement of structures that benefit insectivorous birds in administrative and housing areas also provides a benefit to people as these birds consume thousands of insects a day, as well as provide entertainment for human observers. Bluebirds, tree swallows, purple martins, owls, and wood ducks are bird species that commonly utilize artificial structures. Bats, mice, and squirrels are other types of wildlife that may also benefit from their use.

Though the Station does not have a formal bird box program, a number of wood duck and bluebird boxes built by local scout troops have been installed and are maintained and monitored by volunteers. Such actions are part of the environmental awareness and outreach program, designed to build community ties, as well as provide benefits to Station wildlife.

4.6.4 Fisheries Management

Several Station inventories and baseline water quality assessments were conducted (Swihart and Daniel 1994, Galvez and Swihart 1999) and a fisheries and aquatic resources management plan was developed (USFWS 2002b) to better manage the Station's freshwater fisheries. The fisheries inventories were primarily focused on game species, though data for nongame species were also recorded. Freshwater ponds included in the assessment at WPNSTA were Roosevelt Pond and Ponds 10, 11, and 12. Ponds surveyed at CAX included Jones Millpond, Cheatham Pond, and Penniman Lake.

Results of the inventories show all of the ponds support viable populations of several game species including largemouth bass, bluegill, and pumpkinseed sunfish. Cheatham Pond, Jones Millpond, and Pond 11 also have redear sunfish. Forage fish populations, however, were low in

all ponds except Cheatham Pond. The collection of numerous young-of-the-year indicates spawning and nursery habitat is adequate and water quality is acceptable. Sedimentation was found to be high in Ponds 10, 11, and 12. Fish size and abundance, however, indicate a lack of food in most of the ponds. Freshwater fisheries resources at the Station were characterized as fair by the USFWS study.

Data from the fisheries surveys indicate several factors may be preventing the development of a high quality fishery at the Station. A lack of plankton, which serve as food for larval fish, and the abundant growth of dense aquatic vegetation that develops in the ponds in late spring, are major factors. It is expected that the excessive growth of aquatic vegetation ties up nutrients, which prevents algal blooms necessary to support larval fish of all species. Contaminants may be another contributing factor, but fish tissue samples have not been tested.

To develop a quality recreational fishery, the USFWS (2002) recommended conducting water drawdowns as a method to control aquatic vegetation and recycle nutrients. A water drawdown regime would include lowering the water level in ponds up to four feet, using a splashboard design, and maintaining the level for an extended time during the winter and early spring. Close coordination and cooperation with the USFWS should be maintained to avoid creating water quality problems during drawdowns. Sources of sediment problems at Ponds 10, 11, and 12 that cause water quality problems should also be located and eliminated. In addition, the voluntary creel survey and fish tissue analyses should be implemented. Creel data should include the species and number of fish caught, their weight and length, and length of time spent fishing at each pond. A specific recommendation for fisheries management at CAX also includes manipulating water levels at Cheatham Pond to help create a better balance of forage to game species.

Past management of Jones Millpond as a drinking water reservoir largely precluded it from being a quality recreational fishery. As a reservoir, Jones Millpond was periodically treated with a copper sulfate pesticide to improve water clarity and taste. However, even at recommended rates of application, this pesticide is highly toxic to fish and aquatic invertebrates, such as crab, shrimp, and oysters (Pimentel n.d.) and keeps algal populations too low to support forage fish populations, which in turn are too low to support healthy game fish populations. Jones Millpond no longer serves as a water supply reservoir for the Station and is no longer treated with pesticides; therefore, fish populations are likely to rebound and fishing opportunities improve.

Continuing to conduct fisheries surveys every three years on the Station's freshwater ponds will provide valuable data to assess the success of management actions and help determine future management.

4.7 Outdoor Recreation and Environmental Awareness

Types of outdoor recreation available at the Station include activities such as hunting, fishing, picnicking, bird watching, horseback riding, boating, hiking, and camping. Station picnic areas, campgrounds, cabins, stables, and the golf course are administered by the Department of Morale, Welfare, and Recreation (MWR) and are not discussed in this INRMP. However, coordination and cooperation between MWR and natural resources staff is necessary for the protection and

management of natural resources on MWR-administered facilities. Natural resources staff cooperate on such issues as the prevention of nonpoint source pollution, nuisance wildlife control, tree care, and other aspects of urban forest management.

4.7.1 Hunting

Hunting opportunities at the Station are available to active duty and retired military personnel and their dependents, civilian employees of the Station and their dependents, reservists, and retired employees of the Station. Spring turkey season is restricted to Station personnel and their dependents and is administered by a lottery system. The above-mentioned persons may also sponsor one guest. Hunting at the Station is regulated by state law and the regional hunting and trapping instruction, COMNAVREG MIDLANT INST 11015.2B (see Appendix B), which has replaced individual base hunting instructions. However, individual bases are allowed to further restrict state regulations as necessary. In accordance with the Sikes Act, user fees are used for the protection, conservation, and management of fish and wildlife such as habitat improvement and related activities.

Safety is a primary management concern of the Station's hunting program. All firearm users must participate in a hunter gun safety course, and all archery hunters must demonstrate competence through a qualification test. Hunters must also obtain appropriate state licenses and base permits to be allowed to hunt on Station lands. Additionally, natural resources staff are improving hunter safety by annually replacing a portion of older tree stands with newer, improved designs.

Portions of the Station that are able to support hunting activities are made available on Saturdays and holidays at WPNSTA and CAX during the Virginia state hunting season and during times set by natural resources management staff. At WPNSTA, approximately 9,427 acres are divided into 19 hunting areas (Figure 4-7). The number of hunters assigned to a particular hunting compartment depends largely on the size of the compartment. Currently, all compartments are designated to allow deer and turkey hunting; however, deer and turkey hunting designations as well as those compartments open to hunting will be determined by natural resources management staff on an annual basis. Up to 275 hunters can be accommodated at WPNSTA on a given hunting day during the fall deer season. Due to the nature of turkey hunting, however, far fewer hunters are permitted to hunt within each compartment and the demand exceeds the available opportunity. Therefore, approximately 30 hunters are selected through a lottery system during the spring gobbler season to control access, improve safety, and increase hunting quality.

Approximately 1,231 acres at CAX are divided into 27 hunting areas (Figure 4-8). Hunting designations and those compartments open to hunting will be determined by natural resources management staff on an annual basis. CAX can accommodate approximately 24 hunters daily during deer season and 7 per day during spring gobbler season.

COLONIAL NATIONAL HISTORIC PARKWAY

CAX

WPNSTA

199

238

Pond 10

Pond 11

Pond 12

Felgates Creek

Indian Field Creek

Hunt Station

Lee Pond

Roosevelt Pond

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

Legend

- Installation Areas
- Open Hunting Area
- Roads

Source: U.S. Navy 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 4-7. Hunting Areas at WPNSTA.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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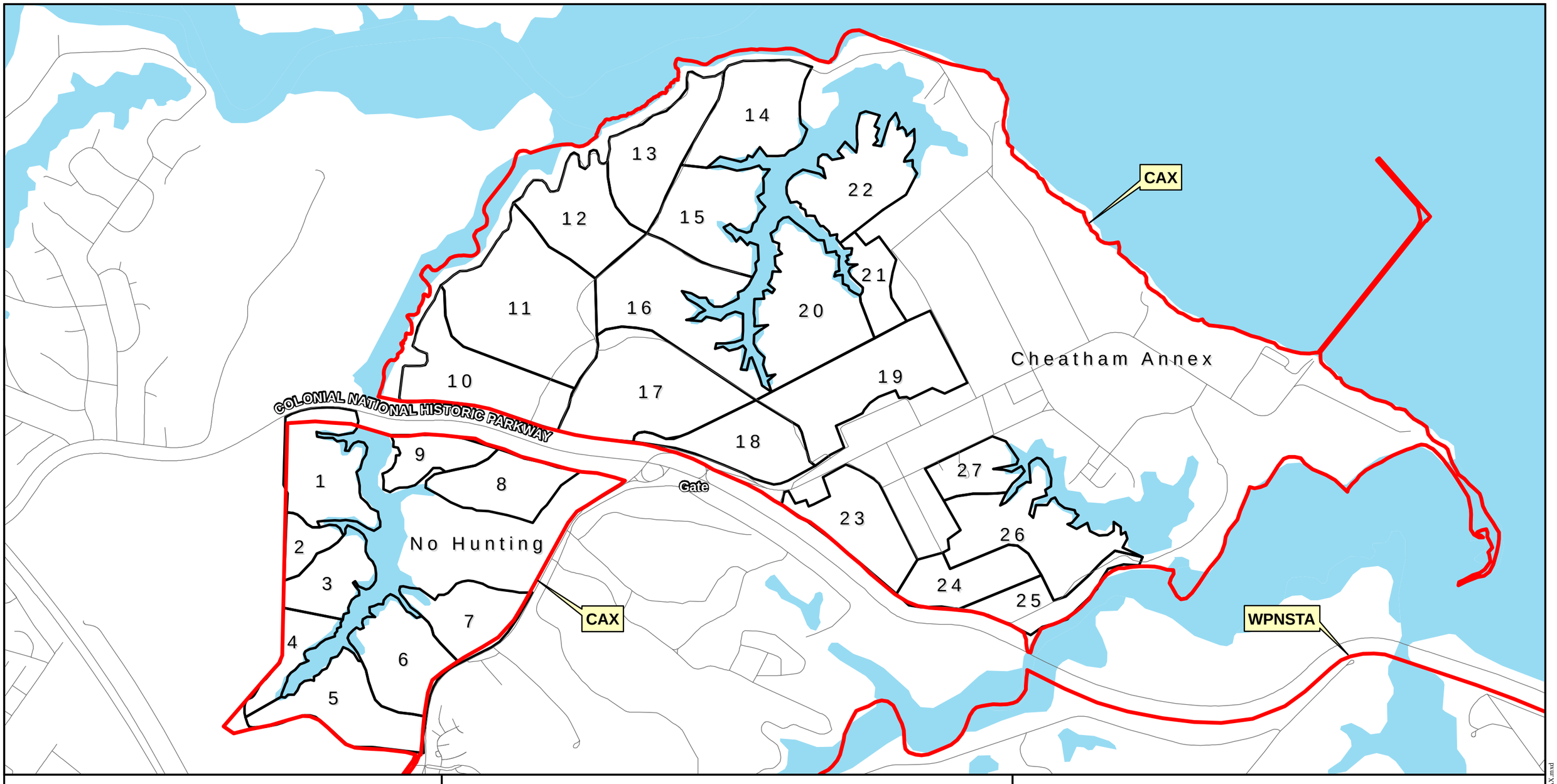

Legend

- Installation Areas
- Hunting Areas*
- Roads

*Open hunting areas are determined by natural resources management staff on an annual basis

Source: U.S. Navy 2009.

0 750 1,500 Feet

0 180 360 Meters

N

Figure 4-8. Hunting Areas at CAX.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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Law Enforcement. Station personnel enforce the hunting and fishing regulations. The Station natural resources staff serve as conservation officers and have the authority to apprehend and arrest all violators of federal, state, or Station game laws and regulations. Law enforcement is solely the responsibility of the Station; however, Station enforcement personnel cooperate with state and federal game wardens, as needed, for the purpose of enforcement of state and federal wildlife laws.

Station conservation officers are required to be trained in law enforcement and state and federal wildlife regulations. Station game wardens have received this training. It is important that Station game wardens attend annual wildlife law enforcement refresher training to stay informed of changes in regulations and enforcement policies.

4.7.2 Fishing

In addition to the Sikes Act, EO 12962, Recreational Fisheries, encourages the development and enhancement of recreational fisheries by federal agencies. The Station offers a variety of fishing opportunities for active duty and retired military personnel and their dependents, current and retired civilian employees of the Station and their dependents, and reservists. The above listed persons may also sponsor two guests while fishing. Freshwater fishing is regulated by COMNAVREGMIDLANT INST 11015.1 (July 29, 2005), which has replaced individual Station fishing instructions. A current state freshwater license and COMNAVREGMIDLANT fishing permit are required for all fishermen between the ages of 16 and 65. MWR administers saltwater fishing from the piers. Saltwater fishing is currently only offered at CAX. The supply pier at WPNSTA dates from the 1920s and was closed for safety purposes. Separate Security Office rules regulate saltwater fishing.

Freshwater fishing is permitted any day of the week at the CAX ponds and Roosevelt Pond at WPNSTA. However, all fishing areas at WPNSTA are located within ESQD arcs and are subject to being closed without notice during munitions handling operations. Because of safety concerns, fishing at Ponds 10, 11, and 12 at WPNSTA is restricted to active duty military with permanent restricted area badges and their family members or guests. Fishing in these ponds is available on Fridays, Saturdays, Sundays, and federal holidays only from one-half hour before sunrise to one-half hour after sunset.

Roosevelt Pond is the principle recreational fishing pond at WPNSTA. A fishing pier and shoreline boardwalk at Roosevelt Pond improve fishing access and protect the shoreline from erosion caused by bank fishing. Penniman Lake and the Walt Feurer Youth Pond at CAX are operated as catch and release fisheries only. Youth Pond is a small recreational fishery specifically for youths 15 years old and younger. The pond has a pier that extends nearly halfway across the pond, which improves fishing access and helps protects the bank. Currently, Jon boats are available for use from a small dock on the north side of Cheatham Pond. Building handicapped-accessible piers at Cheatham Pond and Penniman Lake are additional actions that would improve fishing opportunities to an important segment of the military community.

4.7.3 Environmental Awareness

Environmental awareness programs sponsored by the natural resources program are an integral part of outdoor recreation and perform an important service for the military and surrounding community. The main goals of the environmental awareness and outreach activities are to enhance visitor enjoyment and awareness and to increase their feelings of responsibility and respect for natural resources.

Natural resources staff sponsor a number of outreach programs that build community ties and partnerships that teach environmental responsibility to students, local Scouts and volunteers. The natural resources staff are involved in events such as the Annual Earth Day beach cleanups held in coordination with CNHP, quarterly cleanups of Catlett Islands, and an Earth Day Environmental Fair co-hosted by the Williamsburg Area Chamber of Commerce and the Busch Gardens theme park.

Other activities that have benefited the Station, as well as the entire Chesapeake Bay community, include a workshop that the natural resources staff hosted on riparian forest buffer zone establishment and management, and the establishment of three riparian buffers, totaling over 6,500 linear feet. The riparian buffer plantings help reduce grounds maintenance costs, stabilize the shoreline, and contribute to the Navy's commitment to the Chesapeake Bay agreements.

Another service to the Station is provided by natural resources staff who conduct tree pruning training for the Station's First Lieutenant's Division. This service improves tree care on the Station and is a first step toward developing a corps of in-house personnel trained in hazard tree and limb removal.

4.8 Threatened and Endangered Species Protection

Primary regulatory protection for threatened and endangered species includes the federal ESA, the Virginia Endangered Species Act (Virginia Code §29.1-563 et seq.) for animals, and the Virginia Endangered Plant and Insect Act (Virginia Code §3.1-1020 et seq.) for plants and insects. The ESA requires all federal agencies to ensure that any action undertaken is not likely to jeopardize the continued existence of a federal-listed threatened or endangered species. Section 7 of the ESA requires federal agencies to request a formal consultation with the USFWS if a proposed action is determined to have the potential to affect a listed species. Section 7 also authorizes federal agencies to carry out programs for the conservation of such species. The Virginia Endangered Species Act gives the VDGIF regulatory authority over federally or state-listed fish or wildlife species in Virginia. Therefore, coordination with VDGIF is also required when actions have the potential to affect listed fish and wildlife species.

The Endangered Species Consultation Handbook is available on the USFWS website: http://endangered.fws.gov/consultations/.

The VDCR-DNH is responsible for inventory, database maintenance, protection, and management of Virginia's natural heritage resources. These resources include habitats of rare, threatened, or endangered plant and animal species; state significant communities; and other natural features. Because state and federal lists of threatened and endangered species change over time, careful tracking and periodic field surveys are needed to confirm the occurrence of rare species at the Station. The VDCR-DNH tracks the current status of natural heritage resources in a database that is available on its website.

Lists of the special plants, animals, and ecological communities of Virginia may be accessed at the VDCR-DNH website: http://www.dcr.virginia.gov/natural_heritage/index.shtml#.

Though several rare, threatened, and endangered species have been documented at the Station (see Section 2.7), the bald eagle and Mabee's salamander are the only state-listed species with recent occurrences. A summary of protective measures for the bald eagle and Mabee's salamander at the Station follows.

4.8.1 Bald Eagle

Three active bald eagle nest sites are known to occur at the Station (Watts and Byrd 2002). One site overlooks Pond 11 at WPNSTA and has been known since 1986. Three separate nests have been built at this particular site, though only two currently stand. In 2002, a second nest site was discovered at CAX along the eastern edge of Jones Millpond and in 2003 a third nest site was discovered at Felgates Creek at WPNSTA. Two additional nest sites occur nearby Station property on adjacent lands. One nest site overlooks Ballard Creek and occurs within the CNHP. The second site is along the northern boundary of the Station near Colonial Parkway.

In Virginia, bald eagles begin building and repairing nests in November and December. Egg laying and incubation occur from January through April with fledging occurring in late July. Nest building and egg laying are the most critical periods of the breeding/nesting season. The bald eagle was delisted from its threatened status under the ESA in 2007; however, legal protection is still provided under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) and the MBTA, as well as the Virginia Endangered Species Act. VDGIF must be consulted when activities have the potential to disturb bald eagles and their nests and is also developing more restrictive management guidelines to protect this state-listed species.

Bald eagle guidelines developed by the VDGIF and the USFWS (USFWS 2002a) are used by the Station to protect this valuable species. These include establishing primary and secondary protection zones around nests sites and restricting certain activities from occurring within those zones during certain times of the year depending upon occupation status. The primary zone is defined as a 750-foot radius and the secondary zone is a 1,320-foot radius around occupied nests. No land-clearing, cutting, habitat modification, or construction activities should occur within the primary management zone at any time of year. During the breeding/nesting season (December 15 to July 15), when a site is determined to be occupied, maintenance of existing buildings and roads, use of motorized vehicles and heavy equipment, and human entry and activities such as

hiking, camping, picnicking, hunting, fishing, boating, jet skiing should be restricted in the primary management zone.

Within the designated management zone, development of multistory buildings, large commercial or industrial facilities, and use of chemicals toxic to wildlife should not occur at any time of year. During the breeding/nesting season (December 15 to July 15), when a site is determined to be occupied, construction activities, aircraft flyovers within 1000 vertical feet of the ground, and loud noise generating activities should be restricted within the management zone. The nature of allowable activities within the management zone should be determined by the VDGIF and the USFWS on a case-by-case basis.

Additional protections are provided to the nest trees and nests themselves. The eagle nest and the tree or structure in which it is located cannot be removed as long as any portion of the nest remains, and protection guidelines must be enforced for abandoned nests for three consecutive nesting seasons after abandonment. Figure 4-9 illustrates the locations and management zones for the WPNSTA and CAX bald eagle nest sites.

The Department of Game and Inland Fisheries provides a link to the Bald Eagle Protection Guidelines for Virginia: http://www.dgif.virginia.gov/wildlife/laws/baldeagleguidelines.pdf

4.8.2 Mabee's Salamander

As discussed in Section 2.7, larvae and adults of the Mabee's salamander were documented in 1990, 1991, and 2007 at the Coastal Plain Depression Wetlands complex and adjacent upland within the Black Swamp Ravines and Flatwoods Ecological Area at WPNSTA (Buhlmann and Ludwig 1992, Petersen 2007). VDCR-DNH searched in this same area during its 2002 rare species inventory; however, unusually dry conditions made detection of Mabee's salamander difficult.

Mabee's salamander requires fish-free ephemeral ponds for breeding and forested uplands for foraging. The Maybee's salamander is a burrowing salamander and it spends much of its life cycle underground in shallow forest floor burrows. Adults move to ephemeral ponds to breed in late winter when the ponds have filled with water and return to adjacent upland forests where they spend the rest of the year. This sensitive life cycle can be disrupted in several ways, both directly and indirectly. Hydrologic alterations, primarily through ditching, but also from excessive groundwater withdrawals, can result in ponds drying out earlier than normal or permanent drying. Premature drying of ponds can be disastrous for salamander larvae, which require several months of aquatic life before metamorphosis into adults. The Mabee's salamander's burrow is shallow, often only 10 to 18 inches deep. As a result, forestry thinning and clearing practices, such as drum chopping, clearcutting, and prescribed burning can damage salamander habitat through the removal of cover, causing displacement or direct loss of life.

Protection measures for this species include establishing a 300-foot buffer zone around individual ponds inside which timber harvesting is not allowed and an additional 300-foot buffer in which selective cuts or thinnings that do not exceed 50 percent of the basal area is allowed. To avoid altering large tracts of habitat, harvesting outside the buffer area should only occur in

small, noncontiguous patches. Timber stand improvement practices such as drum chopping and prescribed burning should also not be allowed in the 600-foot buffer area. Due to the sensitivity of amphibian species to various forms of water pollution, herbicide and pesticide applications should also not be conducted within or near the boundaries of the 600-foot buffer area. Existing pine stands within the buffer boundaries may be thinned manually and natural hardwood regeneration encouraged. Eventually the pine will be replaced by mixed pine and hardwood, which is the preferred cover for Mabee's salamanders.

Legend

- Bald Eagle Nest Sites

Bald Eagle Protection Buffers

- Primary (0-750 feet)
- Secondary (750-1320 feet)
- Installation Areas

Source: U.S. Navy 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Figure 4-9. Bald Eagle Nest Site Locations and Protection Zones at WPNSTA/CAX.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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4.9 Habitat Conservation

The primary factor in threatened and endangered species protection at the Station is the protection of habitats that are important to the continued survival and expansion of threatened and endangered species populations. Consultation with VDCR-DNH prior to any land use change or change in management practices on each of eight ecological areas identified for the WPNSTA and CAX (Figures 2-9 and 2-10) will be held to ensure protection of the unique and significant habitats as well as the diversity wildlife and plant species. CNHP will also be consulted on management issues that have the potential to affect shared natural heritage resources. Management recommendations for the eight sites summarized from Van Alstine et al. (2003) follow.

4.9.1 Ballard Creek Ravines

The most serious threats to the Ballard Creek Ravines Ecological Area are logging and invasive plants such as Japanese honeysuckle (*Lonicera japonica*) and Japanese stiltgrass (*Microstegium vimineum*). Because of the steepness of the slopes and moderate to high erosivity of the soil, expanding development in the upland areas beyond the picnic area could negatively impact the important natural resources of this ecological area.

Due to the occurrence of significant patches of Coastal Plain Dry Calcareous Forest/Woodlands (Figure 2-9), this area should continue to be managed as a mature forest block. Timber harvesting, land clearing, and other activities that disturb the ground or would encourage the spread of invasive species will be avoided. Any future development on the upland portions of the site should be carefully managed to protect the steep slopes from runoff and erosion. In addition, VDGIF and USFWS bald eagle protection guidance will be observed during the breeding/nesting season (December 15 to July 15) (see Section 4.8.1) within bald eagle protection zones developed for the CNHP nest site (Figure 4-9).

4.9.2 Roosevelt Pond

Logging and invasive plant species, such as Japanese honeysuckle and Japanese stiltgrass, are the major threats to the Coastal Plain Basic Mesic Forest (subtype) communities at the Roosevelt Pond Ecological Area (Figure 2-9). The alteration of water chemistry from sedimentation and nutrient loading is the most serious threat to the fibrous bladderwort population that occurs in Bracken's Pond on the adjacent CNHP property. Because of the significant stands of exemplary Coastal Plain Basic Mesic Forest (subtype), this site will continue to be managed as a mature forest block. Timber harvesting, land clearing, and other activities that disturb the ground or would encourage the spread of invasive species will be avoided. No future development is likely to occur in this ecological area because of its location within the ammunition loading pier explosive hazard zone.

4.9.3 King Creek Ravine

Hydrologic disturbances, logging, beavers, and invasive plants, especially Japanese stiltgrass, are the most serious threats to the King Creek Ravine Ecological Area and should be closely monitored. This area will continue to be managed as a hardwood forest block; however, no

silvicultural treatments are planned for the site. Road maintenance and any other activities that could negatively affect the hydrologic recharge and water quality of the Coastal Plain Basic Seepage Swamp community, which occurs here, will be carefully planned to avoid such impacts.

4.9.4 Black Swamp Ravines and Flatwoods

Hydrologic disturbance, logging, and invasive plants (i.e., primarily Japanese honeysuckle and Japanese stiltgrass) are the most serious threats to the several significant natural communities that occur within the Black Swamp Ravines and Flatwoods Ecological Area (Figure 2-9). Activities such as ditching or timber harvesting that have the potential to affect hydrology or disturb upland habitat would be particularly destructive to the depression ponds and rare species associated with them. Beavers could also pose a threat to the seepage swamp occurrences in the lower tributaries of the Black Swamp.

Future forest management within the Black Swamp Ravines and Flatwoods Ecological Area will focus on the protection and enhancement of the significant communities occurring on the site. In particular, the depression pond complex will be protected by a 300-foot no harvest buffer and an additional 300-foot selective harvest area during harvest operations. Construction and other activities that could negatively affect the hydrologic recharge and water quality of wetland habitats will be avoided in sensitive areas, and steep slopes will be protected from runoff and erosion during road maintenance and repair and development activities.

4.9.5 Halstead Road Sinkhole Ponds

As with the Black Swamp Ravines and Flatwoods Ecological Area, future forest management of the Halstead Road Sinkhole Ponds should focus on the protection and enhancement of the significant communities and a wooded buffer area around them. The pine stands immediately adjacent to the identified Coastal Plain Depression Wetlands (Figure 2-9) should be manually thinned to encourage the establishment of a hardwood-dominated forest.

4.9.6 Pond 11

Timber harvesting or development activities are not likely to occur at the Pond 11 Ecological Area (Figure 2-9) and since the area is within the Station's restricted area, there are few potential threats to the site. In addition, VDGIF and USFWS bald eagle protection guidance will be observed during the breeding/nesting season (December 15 to July 15) (see Section 4.8.1) within bald eagle protection zones developed for the nest site occurring here (Figure 4-9).

4.9.7 Jones Millpond

The Jones Millpond Ecological Area (Figure 2-10) encompasses the central portion of the Jones Millpond tract and includes a 1,320-foot radius protection zone centered on a bald eagle nest found in 2002 (Figure 4-9). Changes in land use, such as development, or change in land management, such as timber harvesting, at this site could cause the nest to be abandoned and would constitute a threat to the site. Consultation with the VDGIF and USFWS would be required for any action taken by the Station with the potential to affect the eagle nest site. In addition, an individual state-rare moth, Franck's sphinx, was captured at this site during the 2002 survey. Little is known about the life history of this species though the host plants for the

caterpillar are known to be white ash and elms. This is only the second confirmed record for the state of Virginia.

4.9.8 Lower Queen Creek

Potential threats to the area that are known to support rare Coastal Plain Basic Seepage Swamps and Coastal Plain Dry Calcareous Forests and Woodlands communities are disturbances such as logging, construction, or road maintenance that would promote an invasion of Japanese stiltgrass by increasing sunlight to the area and increase sedimentation in the ravine bottoms. To protect these natural heritage resources, any ground-disturbing activities, which could affect the hydrology of the ravines and cause erosion and sedimentation, will be restricted on portions of the Station within this ecological area.

4.10 Fire Management

4.10.1 Wildland Fire

WPNSTA is an ordnance facility; therefore, great emphasis is put on the prevention of wildfire. Flame-producing devices are not permitted within the restricted area, and there is no smoking allowed in any vehicle anywhere on the Station. To date, the Station's fire prevention has been extremely successful with only spot fires associated with ordnance disposal and grounds maintenance being recorded in recent history.

Though few wildland fires have occurred at the Station, Department of Defense Instruction 6055.6 and the DoD Fire and Emergency Services Program direct installations with unimproved lands that present a wildfire hazard and installations that use prescribed burns as a land management tool to develop and implement a Wildland Fire Management Plan (WFMP). The WFMP is integrated with management objectives identified in this INRMP.

Evaluating, monitoring, and where necessary, reducing the potential fire hazard across the landscape are important parts of wildfire management. Because potential fire hazard differs between vegetative community types that occur at WPNSTA and CAX, it is important to understand the fire hazards associated with each type. Variation in hazardous fuel loads is the primary cause of these differences and is discussed below.

4.10.2 Hazard Fuel Management

The quantity and arrangement of hazardous fuel loads throughout the landscape greatly influence the severity of wildfires. Hazardous fuels include dead woody debris and flammable shrubby undergrowth. A fuel monitoring program that identifies sites where the quantity or arrangement of fuels has the potential to be hazardous is important for preventing wildfires.

Oak and mixed hardwood stands have relatively low fuel loading rates, assuming they are healthy stands undisturbed by insect or disease outbreaks. These stands comprise relatively long-lived, shade-tolerant species that regenerate in gaps formed when mature individual trees die or blow over. Fuel loads may increase temporarily in the gaps where trees have died and fallen, but overall the fuels would support surface fires only.

Sites that have a greater potential to have hazardous fuel loads include stands of early successional, shade-intolerant species and even-aged plantations dominated by a single shade-intolerant species such as loblolly pine. The initial density-induced mortality of suppressed trees that is common in such stands can result in a relatively large amount of dead fuel over a short period of time. Following the initial mortality, the fuel load will decrease for a period of time. However, if the density reaches high levels again, mortality and fuel levels will increase. This phenomenon is not likely to occur in mixed stands that are typical of more advanced successional stages or where shade-tolerant species are present. Shade-tolerant trees slow in growth rather than die when the stand becomes dense.

Thinning pine stands to moderate densities, maximize stand growth, and prevent the addition of more dead trees to the fuel load. Thinning also breaks the vertical continuum of fuel as the spacing increases between trees and dead branches lower on the trunks are broken. Vigorously growing pines also will reduce the chances of pine beetle attack. Over-thinning in pine stands, however, can increase understory growth, which increases fuel loads and should be avoided. Prescribed fire may also be used to reduce hazardous fuel loads in pine stands. Fire, however, inhibits the growth of oaks and other hardwoods that would eventually reduce the stand's susceptibility to wildfire.

Pine and mixed pine-hardwood stands that are losing mature pine in patches are other areas in which fuel management may be needed to control hazardous fuels. In these areas, pines that have fallen or are leaning against other trees create fuel ladders that reach the tree canopy. Felling leaning and standing dead pines and cutting and scattering piles of dead logs removes the fuel ladder and hastens decomposition of the dead trees.

Other areas that should be considered for fuel management include sites on which maintenance activities have resulted in small buildups of boles and branches along roadsides or in debris piles. These areas should be cleaned by completely removing the large piles of logs, or scattering small piles so each bole rests on the ground where it will decompose faster in contact with soil moisture and organisms.

Beyond monitoring fuels through the natural changes that occur in forest stands over time, the effects of natural disasters, such as severe storms and disease and insect outbreaks, on fuel loading need to be assessed when they occur. Depending on the type and extent of damage, firewood cutting, cutting and scattering, or salvage operations will be considered.

4.10.3 Prescribed Fire

Prescribed fire is a management tool that is widely used to control or manipulate vegetation. It is often used in natural resources management to accomplish the following:

- Reduce hazardous fuel accumulation;
- Prepare sites for seeding and planting;
- Manage early successional habitat;
- Improve wildlife habitat; and,

- Control undesirable vegetation.

Use of prescribed burning at the Station has primarily been limited to site preparation and reduction of hardwood vegetation in pine stands, though potential future uses include maintaining early successional areas and native warm season grasses. The Station forester prepares an annual burn plan that follows the guidelines of the State Prescribed Burn Program and prepares a map that indicates each burn unit and the location of all fire lines, firebreaks, roads, adjacent properties, and other important landscape features. A sample prescribed burn plan for the Station is included in Appendix E. Prescribed burning is fully coordinated with the Station Fire Department, and the Regional Natural Resources Manager. VDOF and the Chief Ranger at CNHP are informed prior to ignition. Though Virginia has a 4 p.m. Burning Law (Virginia Code §10.1-1142 B) that prohibits the general public from burning on open lands before 4 p.m. from February 15 through April 30, federal facilities are exempt (VDOF 2002b).

Smoke Management. Smoke management is a major concern in conducting prescribed burns. Besides affecting visibility, smoke affects air quality by releasing significant amounts of carbon monoxide, particulate matter, and volatile organic compounds, all of which are regulated by the EPA. Current EPA policy on emissions from prescribed burns emphasizes voluntary smoke management plans (Interim Air Quality Policy on Wildland and Prescribed Fire of April 1998). Burn plans must identify all adjacent smoke-sensitive areas and wind direction and speed, and smoke dispersal must be considered before conducting a burn. Using backfires as a firing technique significantly reduces smoke emissions. Three to five times less particulate matter is produced with backfires and flankfires than headfires. Other fire management practices that minimize impacts from smoke include:

- Reducing excess woody debris through the mechanical removal of harvested trees and slash from sites before burning;
- Avoiding burning during pollution control alerts;
- Utilizing backfires as the primary firing technique;
- Scheduling burning during favorable weather conditions that allow for good smoke dispersal (i.e., mixing height between 1,700 and 6,500 feet and transport wind speed from 9 to 20 mph help ensure adequate smoke dispersal);
- Extinguishing smoldering stumps and snags quickly; and,
- Limiting the amount of land that is burned at one time.

Additionally, burning should be completed before late afternoon or evening when temperature inversions and stable wind conditions are likely to inhibit smoke dispersal, and adjacent property owners who may be impacted by smoke must be informed of all planned burns.

Smoke management guidelines are presented in the
Prescribed Fire Smoke Management Guide (VDOF 1998):
http://www.dof.virginia.gov/fire/resources/prescribed-fire-smoke-mgmt.pdf

Weather Conditions. Weather information is needed to determine what will happen to the smoke, as well as to determine the behavior of the fire. Regional fire weather conditions can be obtained from the National Weather Service for planning a burn; however, observations must also be obtained at the prescribed burn site to ensure ideal conditions. Extreme caution must be used when temperatures exceed 55°F because greater damage to plant life can occur during high temperatures. Wind velocities that are too low (below five miles per hour) are also dangerous and may result in excessive crown scorch. To ensure a safe, effective burn, guidelines set by the VDOF Fire Protection Team (VDOF 1998) must be followed. Guidelines for dormant season burns include the following:

- Burn season from October 1 to March 15;
- Air temperature from 20° to 50°F;
- No significant rainfall 3 to 7 days prior to burning;
- Relative humidity from 30 to 50 percent;
- Wind direction as required to direct smoke;
- Wind velocity from 5 to 10 miles per hour (i.e., in-stand wind of 1 to 3 miles per hour); and,
- Fine fuel moisture of 7 to 20 percent.

Fire weather forecasts are available at the National Weather Service website: http://www.spc.noaa.gov/products/fire_wx/.

Safety Equipment. Prior to conducting a prescribed fire, important safety measures to implement include conducting a review of prescribed burn guidelines and bringing a prepared list of important contacts and phone numbers (e.g., Station and local fire departments). The following is a standard list of equipment that should be on hand prior to implementing a prescribed fire:

- Prescribed burn plan;
- Burn area maps and aerial photographs;
- Two-way radios;
- Drip torches;
- Fuel cans with gasoline/diesel (one part gasoline to three parts diesel) mixture for drip torches;
- Matches or propane lighter;
- Backpack pumps;
- Flappers, fire rakes, and shovels;
- Small bottle of dishwashing detergent*;

- Nomex clothing if possible, no synthetics, use long sleeves, no cuffs in trousers;
- Heavy leather gloves;
- Heavy leather boots;
- Safety goggles;
- Smoke mask;
- Water cooler and cups; and,
- "CAUTION SMOKE" signs.

*A teaspoon of dishwashing detergent added to a backpack pump full of water will lessen the water surface tension and increase the ability of that water to suppress jumps and spots.

In accordance with DoD Wildland Fire Management Guidelines, all military, civilian, contractor, and emergency services personnel involved in wildland fire management must possess certifications appropriate for their expected level of involvement in the wildland fire program. All DoD personnel must meet the National Fire Protection Association's (NFPA) professional qualification standard (NFPA Standard 1051).

4.11 Pest Management

The goals of pest management are to prevent or control pests and disease vectors that may adversely affect military readiness or operations by affecting the health of personnel or damaging structures, material, or property. It is Navy policy to employ an IPM approach to pest control. IPM is an environmentally sound approach to pest management that promotes non-chemical controls and stresses prevention to avoid unacceptable levels of pest damage. The Station's current Integrated Pest Management Plan provides the foundation for Station pest management requirements, resources, and procedures and overall IPM approach. Natural resources personnel are certified pesticide applicators and cooperate with grounds maintenance personnel in the control of insect pests, nuisance wildlife, invasive species, and noxious weeds. A variety of biological, cultural, and mechanical pest management strategies used in IPM are discussed below for the major types of pests occurring at the Station.

The Armed Forces Pest Management Board has information on DoD pest management policy and issues on its website: http://www.afpmb.org/.

4.11.1 Insect Pests

Insects that are of primary concern to natural resources management include forest pests (see Section 4.5) and pests of ornamental plants. The keys to ensuring success in ornamental plantings include the use of native species, proper planting methods, appropriate site selection, adequate irrigation during plant establishment, and employing trained personnel. Non-chemical methods of pest control are employed whenever practicable for the maintenance of ornamental plants. Pruning, hand picking, use of water or soap sprays, and pheromone traps are preferred

methods. To be effective, these controls should be scheduled to interrupt the pest's life cycle. For example, pruning of infected material and hand picking or destroying egg sacks should occur before young disperse, generally in the early spring.

Pesticides may be used if surveys indicate control is beyond biological or cultural control methods. A certified pest controller must approve the use of all pesticides at the Station and only pre-approved pesticides, as listed in the pest management plan, may be used. Sensitive areas such as wetlands, waterways, and nontarget organisms must be identified and protected from contamination.

4.11.2 Nuisance Wildlife

Nuisance wildlife are wildlife that, because of their feeding or nesting habits, interfere with the military mission or well-being of domestic animals, other wildlife, or humans. Primary nuisance wildlife at the Station includes Canada geese, mute swans (*Cygnus olor*), beaver, woodchucks, and white-tailed deer. Note: Although this INRMP refers to some species as "nuisance wildlife" this does not reflect those species offer the legal designation as "nuisance" by the State of Virginia.

Pursuant to COMNAVREG MIDLANT INST 11015.3, the Commanding Officer, Navy Public Works Center, Norfolk is responsible for management and control of, and for providing services pertaining to, fish and wildlife, feral animals, invasive species, and pests. On behalf of Commander Navy Region, Mid-Atlantic, the Regional Engineer obtains natural resources permits required by federal law to carry out this program. Regional Engineer authority, in natural resources matters, may be sub-delegated to a properly trained Regional Natural Resources Program Manager, under the supervision of the Regional Environmental Group Head.

Resident Canada Geese. The resident Canada goose population has grown significantly throughout the eastern United States during the past 20 years, and though the rate has slowed in the past several years (VDGIF 2006), Canada geese are considered a nuisance in many places. In contrast to resident geese, the migrant Canada goose population declined in the late 1980s and early 1990s. Since the early 1990s, the state has implemented special hunting regulations to manage resident goose populations and shift the population balance toward migrant populations. The special goose-hunting season occurs in September before the migrant geese arrive in Virginia.

Geese are particularly problematic at the golf course at CAX. This area is attractive because it provides an open flyway, mowed vegetation, which increases their ability to see predators, and water for escape. Modifying the habitat to exclude one or more of these elements is one way to discourage geese from settling in an area. Various methods of frightening geese from the area may also be used. Creating loud noises and flares with pyrotechnics or boom cannons and using recorded distress calls are successful if they are altered frequently and used constantly.

Both resident and migratory Canada geese are legally protected under provisions of the MBTA. Therefore, coordination with Animal and Plant Health Inspection Service-Wildlife Services (APHIS-WS) and VDGIF is required if any effort is made to handle or harm the geese outside the legal hunting season. APHIS-WS is responsible for producing a damage report, which must

be forwarded to VDGIF, which issues the necessary permit for harassing geese. Capturing and relocating migrant geese to a more acceptable location also requires a permit from VDGIF. Resident geese may not be relocated, and the relocation of migrant geese is becoming increasingly difficult because there is a general overpopulation of geese at other acceptable sites.

Guidelines that describe methods of habitat modification, exclusion, and frightening nuisance geese and other waterfowl are available from the Animal and Plant Health Inspection Service-Wildlife Services at: http://www.aphis.usda.gov/wildlife_damage/.

Mute Swans. The mute swan is an exotic species, native to Europe and Asia, which was introduced into North America 60 to 70 years ago. They primarily reside in estuarine river habitats with smaller numbers on inland lakes and ponds. Mute swans are larger than the native tundra swan (*Cygnus columbianus*), which also occurs at the Station. Mute swans have an orange bill as opposed to the black bill of the tundra swan. Mute swans often swim with their neck held in an S-curved position and hold their wings arched up over their backs. The neck of the tundra swan is generally held straight up and its wings lie flat on its back. The mute swan is not migratory and spends both summer and winter in Virginia. Mute swans have been nesting in Virginia for over 20 years and their numbers are increasing. These swans compete for food and habitats with our native waterfowl and can displace other native bird species such as shorebirds, terns, and skimmers .

Mute swans have been observed in several areas on or nearby the Station. During a 2002 bird survey, three mute swans were observed at King Creek and two at Jones Millpond (Van Alstine et al. 2003). During a 2009 field effort within the CAX expansion area mute swans were observed in Cheatham Pond (Tetra Tech 2009). The mute swan population will be continually monitored to determine its population status and seasonal distribution.

White-Tailed Deer. Deer populations throughout Virginia generally have been increasing in recent years. Though the regulated deer hunting program at the Station helps control the Station population, increases in regional populations and increases in area development have caused damage to gardens and ornamental plantings by deer to become more common. Various types of exclusion devices and repellants are available to prevent deer damage. Deer-proof fencing can be effective; however, it is costly, requires maintenance, and does not usually blend well with landscaped environments. The use of repellents has been shown to reduce, but not eliminate, damage. Their effectiveness varies with deer density, season, and availability of alternate foods. To be effective, repellents must be applied before deer begin actively browsing in an area. Repellents based on the fungicide Thiram are the most effective, followed by putrescent egg solid repellents and ammonia soaps of higher fatty acids. Bar soaps, human hair, and tankage (i.e., animal by-products or fecal residue) are also effective when hung in mesh bags at short intervals (Masters et al. 1992).

Beavers. Beavers can become nuisance species when their dam-constructing activities block culverts and cause flooding of roads. Affected culverts should be treated with a beaver exclusion device to prevent blockage. If beavers persist in the area and continue to cause damage, more intrusive measures, including trapping and destroying, may be required. VDGIF discourages

trapping and relocating because habitats suitable for beaver are already populated with beaver. Beaver damming has environmentally beneficial aspects; therefore, control actions are only taken when necessary.

Woodchucks. Woodchucks can present a threat to the integrity of the earth-covered magazines and must be controlled in the magazine areas. Natural resources staff control nuisance individuals by trapping and removing them from the site.

Feral Cats and Dogs. Pets that have been abandoned or left behind by owners can become serious pests on military installations. Feral pets may carry diseases such as rabies, distemper, and feline leukemia (cats) and pose a serious health threat to humans and other family pets. It is therefore important to ensure that pets on the Station are properly vaccinated, tagged, and registered when brought onto the Station. In addition, feral animals and loose pets, particularly cats, are known to be very damaging to neotropical migratory bird populations and other native wildlife. To reduce impacts to native wildlife and in accordance with OPNAVINST 5090.1B Chapter 3, privately owned animals are not permitted to run at large on the Station. Pet owners should also be encouraged to neuter their pets to reduce the occurrence of unwanted animals.

The Chief of Naval Operations (CNO) Policy Letter of January 2002 on Preventing Feral Cat and Dog Populations on Navy Property states Navy policy on feral pets. In accordance with Navy policy, the Station must adopt proactive pet management procedures that prevent the establishment of free-roaming cat and dog populations on the Station. Additionally, the Station must ensure the humane capture and removal of feral cats and dogs, and every effort should be made to find homes for adoptable animals. Assistance from the local animal control warden should be sought for capture and placement or disposal of feral cats and dogs. Increasing public awareness of the problems associated with feral cats is a primary factor in controlling feral pet populations. Station personnel and residents should understand that feeding feral cats and dogs is an unacceptable practice that may cause feral and other predator populations such as raccoons to increase. Prompt garbage removal and keeping dumpster and refuse receptacles covered with tight-fitting lids are other important practices.

The Peninsula Society for the Prevention of Cruelty to Animals in Newport News, (757) 595-1399, provides service to the Station.

Miscellaneous Vertebrates. In and around buildings, a number of vertebrate species such as groundhogs, squirrels, mice, rats, skunks, and opossums can be considered nuisance pests. Natural resources managers, and all other personnel involved in lethal control activities, must be properly trained and duly certified for all weapons employed in accordance with applicable regulations.

Miscellaneous Birds. Birds nesting in buildings or other structures can cause potential health hazards if allowed to persist in or around heating, ventilation, and air conditioning systems. Birds that frequently become problem species include house sparrows, European starlings, and pigeons, which are species that have adapted to take advantage of urban environments and are not regulated by migratory bird laws. Bird-proofing buildings by blocking all entryways is the

most permanent solution to bird infestations. Trapping, shooting, mechanical repellents, and nest removal may be used in conjunction with bird-proofing for pigeon, European starling, and house sparrow control. Though European starling, English sparrow, and pigeon (rock dove) are not protected by the MBTA, all other songbirds are and may not be harmed or harassed.

4.11.3 Invasive Species

Many nonnative species that have been used in agriculture or erosion control, or as ornamentals, or that were accidentally introduced have become problematic weed species that are now considered a leading threat to natural ecosystems and biodiversity worldwide. Several statutes and EOs, including the Chesapeake Bay Preservation Act, EO 11987, Exotic Organisms, and EO 13112, Invasive Species, address the control of invasive, nonnative species on federal facilities. EO 11987 specifically restricts the introduction of harmful exotic species into native ecosystems, and to the extent practicable and permitted by law, EO 13112 requires that federal facilities:

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

Vegetation surveys conducted at WPNSTA and CAX by VDCR-DNH and GMI during 2002, and conducted at the 786-acre CAX expansion area by Tetra Tech, Inc. during 2009, identified more than 20 nonnative species (see Appendix C), a number of which are considered highly invasive and a threat to natural ecosystems. Several of the most widespread and problematic species encountered include Johnson grass (*Sorghum halepense*), Japanese stiltgrass, and Japanese honeysuckle. Johnson grass, which is listed as a noxious weed in Virginia, occurs in many grassland areas and along roadsides, and is aggressively combated in wildlife food plots. Japanese stiltgrass occurs along nearly every drainage, wood road, and disturbed forest site at WPNSTA and CAX. Japanese honeysuckle is a widespread problem species of old fields, roadsides, and disturbed forest sites. Two species of autumn olive (*Elaeagnus umbellata* and *Elaeagnus pugens*), are also extremely widespread and occur on a number of forested sites, old fields, and roadsides. Privet (*Ligustrum* spp.) is another invasive nonnative, which is abundant on forest edges and disturbed sites. Tree-of-heaven (*Ailanthus altissima*) occurs frequently mixed with other species such as mimosa (*Albizia julibrissin*), grapes (*Vitis* spp.), and privet on disturbed sites in the woods on what appear to be debris piles. Open fields and lawns were not surveyed. These areas are likely to be composed of a number of nonnative agricultural and lawn grasses, clovers, and a variety of native and nonnative forbs.

Common reed (*Phragmites australis*) is an extremely invasive species that colonizes disturbed emergent wetlands sites. Relative to the amount of estuarine marsh at the Station, very little common reed actually occurs, which indicates a low level of disturbance in this habitat type. One extensive area of common reed, however, does occur at WPNSTA. A former sludge-

dewatering site on a York River tributary, where the soils and hydrology have been disturbed, is now dominated by common reed. Another relatively large site occurs along the York River at CAX on a site that was previously treated for bank erosion.

Resources for the control of invasive plants may be limited and not all invasions warrant control, therefore, efforts will focus on sites that are considered ecologically significant and where there is a high feasibility of control.

A list of Virginia's invasive species, methods of control, and fact sheets are available on the VDCR-DNH websites: http://www.dcr.virginia.gov/natural_heritage/invspinfo.shtml.

General Control Methods. Control of many invasive species is often difficult because of their ability to sprout when damaged. Cutting tree stems and leaving root systems results in numerous sprouts where one stem once stood, and pulling up smaller plants by the roots is ineffective when small pieces of root are left to regrow. Herbicides offer an effective control with some species by killing the whole plant including the roots. Japanese honeysuckle is effectively controlled by foliar applications of herbicide as it has a higher percentage of foliage compared to stems and roots. However, tree-of-heaven is not completely controlled by herbicides, as their roots are so extensive that the chemical is not transported throughout the whole root system when sprayed onto the foliage.

Cultural treatments such as cutting, mowing, and burning are alternative methods of controlling invasive species. Small sites in particular are appropriate for use of mechanical methods, which are more labor intensive than chemical applications. Cutting or mowing is an effective way to control tree-of-heaven and autumn olive if the treatments are persistently done until the root system has run out of reserves and can no longer sprout. Cutting may be necessary every few weeks; therefore, these sites must be monitored frequently until the trees have died. Japanese honeysuckle is not tolerant of fire; therefore, prescribed burning used to maintain warm season grasses can control it.

Exotic species control activities should be documented so that the effectiveness of various control measures can be determined. In general, the exotic species population should be mapped before treatment and monitored after treatment to determine effectiveness.

4.12 Cultural Resources Management

Locating and determining the significance of cultural resources relative to the Native American Graves Protection and Repatriation Act and/or eligibility for inclusion in the National Register of Historic Places (NRHP) is considered the responsibility of each federal agency. The regulations and procedures in 36 CFR 800, which implements Section 106 and Section 110 of the National Historic Preservation Act (NHPA), require federal agencies to consider the effects of their undertakings on properties listed in, or eligible for inclusion in, the NRHP. Under Section 110 of the NHPA, federal agencies are required to identify all cultural resources within their landholdings that are eligible for inclusion in the National Register. Sections 106 and 110 of the NHPA outline the historic preservation responsibilities and processes that federal agencies must

conduct for every undertaking. Prior to approval of the proposed action, the regulations require that the State Historic Preservation Officer (SHPO) and the National Advisory Council on Historic Preservation be afforded the opportunity to comment. Details of these regulations and the process required to meet the obligations set forth by these regulations are detailed in the Integrated Cultural Resources Management Plan (ICRMP) developed for WPNSTA (U.S. Navy 1999a).

In 2001, a 6,000-acre survey was completed at WPNSTA (U.S. Navy 2002b). As a result, a total of 8,515 acres of the Station has been archaeologically surveyed, leaving mainly heavily developed and restricted portions of the base unsurveyed. As such, this latest survey nearly satisfies identification requirements for archaeological sites set forth under Section 110 of NHPA on properties under WPNSTA's jurisdiction. A total of 366 archaeological sites (both historic and prehistoric) has been recorded on the installation dating from the Paleo-Indian through late historic periods. The 2000–2001 survey identified 246 of the 366 sites known at WPNSTA. Of the 120 sites recorded prior to the 2000–2001 survey, one is currently listed on the NRHP, five have been determined eligible for listing, and 49 are potentially eligible (U.S. Navy 1999a). The listed site and the five sites determined eligible for listing are all historic domestic sites. The 49 sites considered potentially eligible contain 26 prehistoric components and 39 historic components. Seventy-two of the 246 sites recorded in the 2000–2001 survey contain components potentially eligible for the NRHP, including 32 Native American and 48 historic period components. Further evaluation for each of these sites would be required before a determination of eligibility for listing in the NRHP could be made. The latest survey report (U.S. Navy 2002b) and the cultural resources maps produced as a result of the survey effort serve as an important planning tool necessary for the continued protection of the cultural resources located on the Station.

All of the structures at WPNSTA have been surveyed for their historic significance, including possible Cold War-era significance. Two resources have been identified at the Station: Kiskiack and the Mason's Row Historic District. Kiskiack, the oldest building owned by the Navy, is a brick "gentry house" built at the beginning of the eighteenth century. Because of its rarity, Kiskiack is categorized at the highest level of significance for protection and preservation and was listed on the NRHP in 1969. The building is currently unused and isolated. Mason's Row Historic District consists of nine whitewashed brick officer's quarters located on the bluff above the York River. These buildings were constructed between 1920 and 1941 and form an architecturally cohesive grouping. The district has been nominated for the State Register of Historic Places because of its representation of the Colonial Revival architectural style. These buildings have been given an average rating in regards to protection and preservation by the Navy (U.S. Navy 1999c).

In 1997, prior to becoming part of WPNSTA, a Historic and Archaeological Resources Protection Plan (HARPP) was developed for CAX (U.S. Navy 1997). This plan documents 18 potentially eligible archaeological sites including six historic period, five Native American, and six multicomponent sites recorded at CAX. Each of these sites requires further evaluation before a determination of eligibility for listing in the NRHP can be made. The HARPP indicates that all 319 structures located at CAX have been determined not eligible for inclusion in the NRHP and that no properties constructed since 1950 were found to possess the exceptional significance in the Cold War era necessary for inclusion in the NRHP (U.S. Navy 1997). The plan also

indicates those portions of CAX determined to be clear of significant cultural resources for planning purposes.

To avoid disturbing cultural resources at the Station, careful planning and consultation with the Station natural resources staff is necessary before any potentially ground-disturbing activities are carried out. The WPNSTA ICRMP and the CAX HARPP have detailed maps of known site locations for use as a planning tool. These documents should be consulted during project planning. It is possible that currently buried and unknown archeological resources may be uncovered during ground-disturbing activities. If any archeological resources are encountered during ground disturbing activities, the ICRMP, 2000–2001 survey, and HARPP provide standard operating procedures to follow. Natural resources staff and the Virginia Department of Historic Preservation should be notified to ensure compliance with 36 CFR 800.11. All construction work would be suspended until a qualified archaeologist could determine the significance of the encountered resource(s). In addition, new structures or buildings with architectural design elements that are incompatible with surrounding historic properties would impact the integrity, character, and/or feeling of the historic property. Therefore, any plans for construction in the vicinity of Kiskiack or the Mason's Row Historic District at WPNSTA would require consultation with the Regional Historic Preservation Officer and the Virginia Department of Historic Preservation prior to construction.

5.0 WPNSTA NATURAL RESOURCE MANAGEMENT UNITS

For the purpose of integrating natural resources management with existing land uses, the land area at WPNSTA has been divided into two natural resource management units (Table 5-1 and Figure 5-1). The management units are based either on operational constraints, as with the Restricted Area Management Unit or on a similar land use, as with the Administrative and Housing Areas Management Unit. Each management unit also has a unifying set of management objectives. The Mumfort Islands and bamboo patch are not actively managed by the natural resources program and are therefore not included in these management units. The management actions and projects discussed for each unit are intended to help meet the Station's management goals and objectives, to maintain regulatory compliance, and to ensure an ecosystem and biodiversity approach to natural resources management.

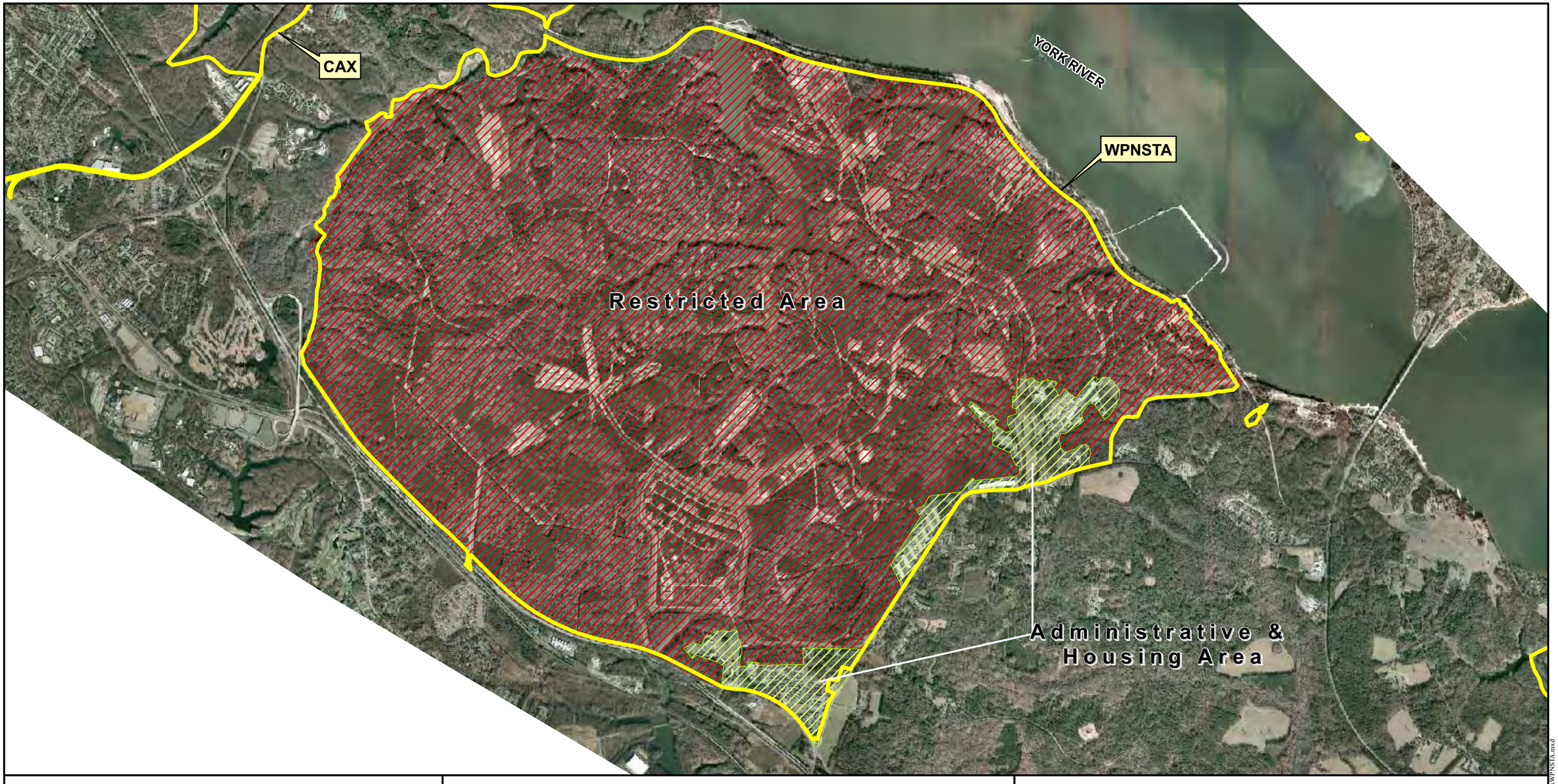
Table 5-1. WPNSTA Natural Resources Management Units.

Natural Resources Management Unit	Acres
Restricted Area	9,790
Administrative and Housing Areas	518
Total	**10,308**

5.1 Restricted Area Management Unit

This Restricted Area Management Unit includes portions of the Station that are encumbered by ESQD arcs, which are restricted areas, and several other small parcels adjacent to the restricted areas. The prime function of this management unit is to support the Station's military mission. All of the Station's ordnance storage, handling, and disposal facilities are located within this management unit. Virtually all of the WPNSTA forest, wildlife, water, and outdoor recreational resources also occur within this management unit. The area consists of 9,790 acres of largely undeveloped forestland, marsh, and open water. Nonforested enclosures in the management unit include the magazine complexes, wildlife food plots, road shoulders, and other maintained open areas. The primary natural resource management topics for this management unit are:

- Wetlands and water quality protection
- IRP site maintenance
- Grounds maintenance
- Demolition site restoration
- Forest management
- Fish and wildlife management
- Outdoor recreation
- Threatened and endangered species protection
- Pest management
- Cultural resources protection



Legend

Installation Areas

Natural Resources Management Units

Restricted Area

Administrative & Housing Areas

Source: U.S. Navy 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

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Figure 5-1. Natural Resources Management Units at WPNSTA.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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5.1.1 Wetlands and Water Quality Protection

The greatest percentage of wetlands at WPNSTA occurs in the Restricted Area Management Unit. To avoid impacts to wetlands, proponents of any future construction, demolition, or other land-disturbing actions should consult the Station's most recent wetland information (Figure 2-5), including the Chesapeake Bay RPA and RMA designations. Current Station wetland, RPA, and RMA information remains at the planning level and site-specific delineation and state, county and federal jurisdiction and approval must be sought prior to beginning any activities that have the potential to impact these areas. Any forestry activities conducted in this management unit will generally avoid wetlands and RPAs. The Station natural resources manager will continue to review erosion and sedimentation plans and oversee construction and demolition work that has the potential to impact water quality.

In support of the Navy's commitment to the Chesapeake Bay agreements, three sites totaling over 6,500 linear feet of riparian buffer zone and 200 acres of upland have been established within this management unit over the past several years. Over 125,000 trees and shrubs were planted in this management unit to enhance overall water quality in the Chesapeake Bay watershed. Periodic inspection of each of these sites is required to ensure that riparian forest buffer development and growth are progressing as intended. Approximately 18 acres of planted riparian and upland buffer that were destroyed in a 2003 wildfire were replanted. Additional replanting, posting "No Mowing" signs, installing plant protection devices, or other actions were scheduled as required at this site to ensure restoration goals were achieved. An additional site, IRP Site 2, identified as suitable for riparian forest buffer establishment was planted in 2002. An additional 800 linear feet of riparian forest buffer on Felgates Creek and nine acres of upland buffer were established at IRP Site 2.

5.1.2 IRP Site Maintenance

All but one of the IRP sites at WPNSTA are maintained by the natural resources program occur within the Restricted Area Management Unit. Natural resources managers will perform routine inspections and maintenance of these sites, including maintaining a viable vegetative cover that fulfills restoration requirements, prevents erosion, and enhances wildlife habitat to the maximum extent possible. Maintenance practices include maintaining drainage structures, controlling invasive species, and fertilizing, seeding, or planting as necessary. Site-specific actions and acreages on which they are practiced were previously discussed (Table 4-1).

5.1.3 Grounds Maintenance

Grounds maintenance issues in the Restricted Area Management Unit include magazine complex and road shoulder maintenance. Natural resources staff will provide oversight of grounds maintenance contracts to prevent unnecessary mowing along roadways and will require posting "No Mowing" signs as necessary. Mowing contracts in bunker areas should require a minimum mower height of three inches and restrict mowing activities in excessively wet or dry weather. Earth slides and gullies that form on bunkers must be treated immediately to protect the integrity of earth-covered magazines.

5.1.4 Demolition Site Restoration

Natural resources staff will review demolition contracts and conduct site visits to ensure that contractors meet basic site criteria. Natural resources staff will develop and implement site restoration plans and conduct long-term maintenance for each site as required (Table 4-1).

5.1.5 Forest Management

All of the WPNSTA 278 forest stands are included in the Restricted Area Management Unit. Forest management is focused on improving stands that are overstocked and in poor condition, preventing catastrophic wildfire, and enhancing wildlife value. Existing stand prescriptions (see Appendix E) will be updated based on 1999 forest inventory data and stand assessments. Stocking levels will be calculated and new stand prescriptions developed for stands that are overstocked or in need of timber stand improvement. Pine stands with basal areas over 80 square feet per acre, in particular, will be assessed and scheduled for thinning. Hardwood-dominated stands at WPNSTA are moderately young, have a diverse composition of oaks and other mast-producing hardwoods, and will generally not require silvicultural treatments in the near future to maintain health or improve wildlife value.

Thinning in small diameter pine stands will be conducted by drumchopping or prescribed fire. However, any silvicultural operations conducted for habitat enhancement purposes in stands that have sensitive ecological resources such as threatened or endangered species or significant ecological communities will be conducted manually. Prescribed fire will also be used for management of hardwood competition and reduction of hazardous fuel loads in select pine stands.

Routine monitoring for forest pests and diseases will be conducted and appropriate emergency silvicultural treatments initiated if an outbreak occurs. Station natural resources staff will also continue to prepare annual work plans for forestry activities.

5.1.6 Fish and Wildlife Management

The Restricted Area Management Unit encompasses a wide diversity of wildlife habitat. Included are salt and freshwater marshes, forested wetlands, upland hardwood and pine forests, ponds, and maintained open areas. Management activities in these areas will strive to maintain all of these habitats to support a full spectrum of the region's native fish and wildlife species.

Much of the Station's early successional habitat occurs within this management unit. These areas will be maintained through a combination of mowing and prescribed fire to provide a variety of grassland and scrub-shrub habitat that will benefit a large number of grassland birds and other wildlife. Select grassland areas dominated by tall fescue will be converted to a mix of native warm season grasses and native forbs.

All of the Station's 49 wildlife food and cover plots, which total approximately 44 acres, are also in this management unit. These plots provide supplemental nutrition for white-tailed deer, game birds, and other wildlife species at times when food resources are low. They also serve to concentrate game species in limited areas, increasing hunter success and hunting quality. The

current practice of mowing approximately two-thirds of the plot area every winter and seeding and fertilizing as necessary will be continued.

White-tailed deer populations will continue to be managed at a level consistent with the WPNSTA's biological carrying capacity and natural resources staff will continue to cooperate with VDGIF to set annual hunting seasons and bag limits utilizing the DMAP for additional assistance in managing the deer population when necessary. Annual harvest records will be collected, summarized, and reported to VDGIF to help assess deer population levels and herd condition. The inclusion of turkey and small mammal harvest information on harvest data forms provides valuable population information and will continue. Turkey data collected includes age (i.e., adult or juvenile), weight, and beard and spur length for all turkeys harvested. These data may be used to assess turkey population condition, trends, and hunting pressure and success as deer harvest data are used to assess deer populations.

To improve habitat quality and fish populations, nonfunctional water control structures at the Station's recreational freshwater ponds will be replaced, as funding permits, with splashboard design structures that allow water levels to be lowered annually. Conducting annual water drawdowns will help control aquatic vegetation that tie up nutrients and reduce dissolved oxygen levels. Close coordination and cooperation with the USFWS is necessary to avoid creating water quality problems during drawdowns. Other actions to improve fisheries management include locating and eliminating the sources of sedimentation problems at Ponds 10, 11, and 12 that were noted in the fisheries survey (USFWS 2002b); implementing voluntary creel surveys; and conducting fish tissue analyses. Fisheries surveys for ponds that are fished in this management unit will be updated every three years.

5.1.7 Outdoor Recreation

Fishing and hunting are popular forms of outdoor recreation at the Restricted Area Management Unit. Deer and turkey hunting is at a maximum level that can be supported given the base mission and available area. Hunter surveys and the collection of harvest data continues to provide valuable population management and hunter success and satisfaction information, and should continue and expand if funding allows.

Approximately 150 permanent tree stands are currently available for hunters in this management unit. Over the past several years, approximately 50 of these have been rebuilt using treated lumber, which will increase stand longevity and reduce long-term replacement costs of the stands. Natural resources staff will continue to replace about one-fourth of the remaining older stands per year. Additional ground stations will be converted to tree stands in the future.

The presence of trained game wardens is an important part of the hunting and fishing programs as it greatly reduces the potential for fish and game violations on the installations. Natural resources staff are required to participate in DoD Fish and Wildlife Law Enforcement training and Federal Phase I Law Enforcement training and should attend annual law enforcement refresher courses.

5.1.8 Threatened and Endangered Species Protection

Documented occurrences of the state-listed bald eagle and Mabee's salamander, and rare ecological communities are located within the Restricted Area Management Unit. Management actions aimed at threatened and endangered species protection primarily include the identification of Ecological Areas (Section 2.8) and the establishment of protective buffers around location data and significant habitats that support or have the potential to support these species. Bald eagle protection zones have been mapped for three nest sites on or near this management unit (Figure 4-9) and USFWS and VDGIF guidelines will be followed in these zones as detailed in Section 4.8.1. Six Ecological Areas have been designated in this management area and include the bald eagle protection zones as well as many rare and exemplary ecological communities (Figure 2-9). Protection measures outlined for the rare Coastal Plain Depression Wetlands community important to the Maybee's salamander are detailed in Section 4.8.2. General protection measures for the six Ecological Areas are detailed in Section 4.9.

5.1.9 Pest Management

Nuisance wildlife control is the primary pest management issue within the Restricted Area Management Unit. Natural resources staff will continue to respond to requests to remove woodchucks, beavers, or other wildlife that cause damage to magazine complexes, roads, or other infrastructure.

Management efforts will focus on controlling Johnson grass in wildlife food plots and on eradicating stands of common reed, autumn olive, and other invasive species where practicable. Control methods will vary by species, level of infestation, and location, but these methods may include both mechanical and chemical treatments. Only approved pesticides listed in the regional pest management plan will be used. Natural resources managers should document and inventory invasive plant species at this management unit and provide an IPM approach to their control and eradication.

5.1.10 Cultural Resources Protection

Most of the Station's 366 known archaeological sites occur within the Restricted Area Management Unit. Sites that are listed, eligible, or potentially eligible for inclusion on the NRHP will be noted on site planning maps and avoided during any activity that has the potential to impact archaeological resources.

5.2 Administrative and Housing Areas Management Unit

The Administrative and Housing Areas Management Unit encompasses the more densely developed portions of WPNSTA. Included in the area are the administrative buildings, facilities maintenance structures, Station housing, storage and warehouse facilities, and concentrated recreation areas (i.e., ball fields and golf course) administered by MWR. The landscape in this area consists of mowed lawns and fields, landscaped trees and shrubs, and small patches of forests contained within the urban setting. This area generally has more intensive grounds

maintenance requirements than other portions of the WPNSTA, as well as other unifying natural resources issues. The primary natural resource management topics for this management unit are as follows:

- Wetlands and water quality protection;
- IRP site maintenance;
- Grounds maintenance and urban forestry; and,
- Pest management.

5.2.1 Wetlands and Water Quality Protection

To avoid impacts to wetlands, proponents of any future construction, demolition, or other land-disturbing actions should consult the Station's most recent wetland information (Figure 2-5), including the Chesapeake Bay RPAs and RMAs. Current Station wetland, RPA, and RMA information remains at the planning level and site-specific delineation and state, county, and federal jurisdiction and approval must be sought prior to beginning any activities that have the potential to impact these areas.

The high concentration of roads, parking lots, and other impervious surfaces pose many storm water management challenges for this management unit. Establishing or enhancing vegetative cover in drainage ditches and establishing vegetative buffers around impervious surfaces should occur where ever practicable within this management unit. Actions to increase vegetative cover include the following: adjusting mowing contracts to reduce mowing in appropriate locations; increasing the use of trees, shrubs, and ground cover plants in landscaping; and establishing riparian forest buffers. Judicious use of fertilizers and pesticides in landscape maintenance and avoiding their use around sensitive areas such as wetlands and waterways is an essential component water quality protection in this management unit. Review of ground maintenance contracts for the implementation of these and other water quality BMPs, as well as contractor inspection, is important to ensuring water quality protection.

The control of erosion and sedimentation on construction and demolition sites is also important to the protection of aquatic resources in the vicinity of this management unit. Erosion and sedimentation control plans and SWP3s for construction sites will be submitted to the natural resources manager for review prior to the start of construction. Natural resources staff will continue to ensure all VPDES approvals and authorizations are obtained and perform site visits during construction to ensure compliance with erosion and sedimentation control plans. Temporarily disturbed areas are to be vegetated and monitored to ensure proper restoration and control invasive species.

5.2.2 IRP Site Maintenance

Monitoring and maintenance of SSA 5, which is a 0.9-acre site located in this management unit, will continue to be conducted by natural resources staff.

5.2.3 Grounds Maintenance and Urban Forestry

Due to the high level of development in the Administrative and Housing Areas Management Unit, effective landscape management is important to maintain aesthetic appeal as well as a landscape tolerant to high levels of human use. Natural resources managers are to ensure effective shadetree management is implemented, unnecessary mowing is reduced, fertilizers and pesticides are controlled, constructed trails and pathways are durable and maintained, and native plants are used within this management unit.

An urban forest management plan that assesses urban forest and landscape features, identifies problem trees and areas should be developed to provide guidance to natural resources managers to improve urban forest health on this management unit. Such a plan would also assist land managers in prioritizing and budgeting tree care work efforts within annual work plans. Natural resources staff will continue to provide tree care instruction to the Station's First Lieutenant's Division and oversee all tree pruning or removal orders.

5.2.4 Pest Management

Natural resources staff will continue to assist with the removal of miscellaneous nuisance wildlife in the administrative and housing areas. The control of feral animals is largely an issue of educating Station personnel and residents on the importance of neutering, keeping pets indoors, and not feeding feral animals. Natural resources managers will utilize the Station's website and newspaper as outreach tools for educating Station personnel about pet control and wildlife interactions.

6.0 CAX NATURAL RESOURCE MANAGEMENT UNITS

CAX has been divided into three separate management units based on land use, management objectives, and constraints. Natural resources management units include undeveloped areas of the main base, administrative and operational areas, and Jones Millpond (Table 6-1 and Figure 6-1).

Table 6-1. CAX Natural Resources Management Units.

Natural Resources Management Units	Acres
Undeveloped Areas of Main Base	1,665
Administrative and Operational Areas	667
Jones Millpond	406
Total	**2,737**

6.1 Undeveloped Areas of Main Base

The Undeveloped Areas of Main Base Management Unit includes 1,665 acres that lie outside of the developed portions of CAX. The area includes Penniman Lake and Cheatham Pond, but is otherwise largely forested and undeveloped. The management unit provides mission support, by serving as a noise buffer and safety zone around the administrative and operational areas, and provides opportunities for outdoor recreation for Station personnel, their dependents, and the military community. The primary natural resources management topics for this management unit include:

- Wetlands and water quality protection;
- Forest management;
- Fish and wildlife management;
- Outdoor recreation;
- Threatened and endangered species protection
- Pest management; and
- Cultural resources protection.

6.1.1 Wetlands and Water Quality Protection

The greatest percentage of wetlands at CAX occurs in the Undeveloped Areas of Main Base Management Unit. To avoid impacts to wetlands, proponents of any future construction, demolition, or other land-disturbing actions should consult the Station's most recent wetland information (Figure 2-6), including the Chesapeake Bay RPAs and RMAs. Current Station wetland, RPA, and RMA information remains at the planning level and site-specific delineation and state, county, and federal jurisdiction and approval must be sought prior to beginning any activities that have the potential to impact these areas. Any forestry activities conducted in this management unit will generally avoid wetlands and RPAs. The Station natural resources manager will continue to review erosion and sedimentation plans and oversee construction and demolition work that has the potential to impact water quality.

Legend

- Installation Areas

Natural Resources Management Units

- Jones Pond
- Operational/MWR
- Undeveloped

Source: U.S. Navy 2009.

0 750 1,500 Feet

0 180 360 Meters

N

Figure 6-1. Natural Resources Management Units at CAX.

Prepared For: NAVFAC Naval Facilities Engineering Command

Prepared By: TETRA TECH

Date: 04/2010

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6.1.2 Forest Management

About 60 percent of the CAX forest stands are located in the Undeveloped Areas of Main Base Management Unit. Maintaining forest health and improving wildlife habitat are the primary forest management goals. Long-term stand prescriptions will be updated using 1998 forestry inventory data and forest inventory data collection for the 786-acre CAX expansion area is planned.

Many of the stands are pine or pine dominated and will be considered for thinning (i.e., stands 3.5, 3.6, and 3.7) or will be considered for harvesting and replanting (i.e., stand 3.10). Several of these stands have shown signs of southern pine beetle and will continue to be monitored regularly for new beetle activity, if not thinned or harvested.

6.1.3 Fish and Wildlife Management

When combined with the Jones Millpond Management Unit, CAX helps to form a large contiguous parcel of forested land that provides opportunity for the management of area-sensitive species. Except for the pine plantations abutting the warehouse area, habitat manipulations and timber harvesting in this management unit will be minimized to avoid habitat fragmentation and edge creation.

As with WPNSTA, the white-tailed deer population will continue to be managed at a level consistent with the Station's biological carrying capacity. Natural resources staff will continue to cooperate with VDGIF to set annual hunting seasons and bag limits at the Station. Annual harvest records will continue to be collected, summarized, and reported to VDGIF to help assess deer population levels and herd condition. Including turkey harvest information on harvest data forms at CAX would provide valuable population information to help manage these populations.

The Cheatham Pond and Penniman Lake are included in this management unit. Installation of water control structures at these ponds will allow the water level to be lowered annually to reduce aquatic vegetation growth and improve fish population structure. Fisheries surveys of these waterbodies should be updated every three years.

6.1.4 Outdoor Recreation

Hunting, fishing, hiking, jogging, and biking will continue to be the primary outdoor recreation activities within the Undeveloped Areas of the Main Base Management Unit and these activities will continue to be promoted and managed by Station natural resources management staff. Two additional recommendations made by the USFWS to improve fishing conditions and accessibility at CAX have been implemented in this area and include, the installation of a fishing pier on Penniman Lake that is designed to accommodate physically disabled fishermen; and manipulating water levels in the ponds as previously discussed.

6.1.5 Threatened and Endangered Species Protection

A large portion of Undeveloped Areas of Main Base Management Unit includes the Lower Queen Creek Ecological Area (Figures 2-10 and 5-1). The boundaries of this ecological area in

this management area encompass an upland area that provides watershed protection for a downstream significant ecological community, a Coastal Plain Basic Seepage Swamp (Figure 2-10). Other natural heritage resources located within this ecological area, are exemplary stands of Oak/Heath Forests and Basic Mesic Forests (Coastal Plain Basic Mesic Forest subtype) ecological communities. Ground-disturbing activities that could cause erosion and sedimentation or disrupt the area's hydrology will be avoided in these portions of the ecological area.

6.1.6 Pest Management

Surveys for invasive plant species were conducted on the CAX expansion area during the general May and October 2009 field surveys. Populations were located with a GPS unit as well as a general estimation of the number of individuals or area of infestation. The survey concluded that the most prevalent invasive plant species on the 786-acre parcel are Japanese stiltgrass (*Microstegium vimineum*) and Japanese honeysuckle (*Lonicera japonica*). These species are present at low densities throughout the interior forested areas, with heavier infestations occurring along roads and trails. The highest density of stiltgrass was in the forested wetlands associated with Cheatham Pond. Autumn olive (*Eleagnus umbellata*) and tree-of-heaven (*Ailanthus altissima*) were observed at moderate densities in disturbed areas such as trails and roadsides. Johnson grass (*Sorghum halepense*) was observed sporadically along some ditches, trails, and roadsides on the new parcel. The populations were generally sparse, although the individuals appeared to be of good vigor and may increase in density in the future. A single, large area along a trail west of Cheatham Pond was observed to contain periwinkle (*Vinca minor*). Very low densities of multiflora rose (*Rosa multiflora*) and yellow iris (*Iris pseudoacorus*) were also observed on site. A formal survey for invasive species in the other portions of the Undeveloped Areas of Main Base Management Unit was not performed, although should be included in future management efforts. Natural resources managers should continue to document and inventory invasive plant species at this management unit and provide an IPM approach to their control and eradication.

Mute Swans are a non-native, invasive species observed during the 2009 field effort in Cheatham Pond. This species has the potential to exclude native species of waterfowl and thereby adversely affect biodiversity at the Station. These populations are to be monitored and managed if they are determined to be an increasing problem.

6.1.7 Cultural Resources Protection

Six known archaeological sites that occur in this management unit are potentially eligible for inclusion on the NRHP. Until further site studies are conducted to determine whether these sites are eligible or not, site maps will be prepared and caution will be taken prior to conducting ground-disturbing activities in the vicinity of the sites. Large areas within the southern and western portions of this management unit have been cleared of requiring any additional archaeological surveys. However, surveys of the 786-acre CAX expansion area have not been surveyed and should be reviewed before land development actions are taken in this portion of the management unit.

6.2 Administrative and Operational Management Unit

The Administrative and Operational Management Unit comprises 667 acres of land that is predominantly developed though significant patches of forest and concentrated recreational areas (golf course, ball fields, and camping areas) are also included. The primary natural resource management topics for this management unit are:

- Wetlands and water quality protection;
- IRP site maintenance;
- Grounds maintenance and urban forestry;
- Cultural resources protection; and
- Pest management.

6.2.1 Wetlands and Water Quality Protection

Wetland and water resources in this management unit include the York River shoreline, the northern shore of Cheatham Pond, areas of tidal marsh along King Creek, the Walt Feurer Youth Pond, and various other streams and wetlands. A GIS planning-level layers of the Chesapeake Bay RPAs and RMAs, as well as the most current wetland delineation information should be referenced during the planning stage of any future construction, demolition, or other project that has the potential to impact wetlands and water quality at this management unit.

The greatest potential for erosion in this management unit occurs on steep bluffs overlooking the York River. Several sites, identified during preparation of the 1999 FISC INRMP are still potential problems and are in need of restoration. During a 1997 site visit, the VDCR Chief Shoreline Engineer developed solutions recommended for controlling erosion at these sites (Hill 1997). Management strategies recommended for controlling erosion at these sites include:

- Removing trees within 30 feet of the bank edge that could result in large soil losses if a tree were to fall, and stabilize the bank with low-growing vegetative cover;
- Regrading the bank to a 2:1 slope or less and installing a riprap revetment at the toe of the slope to prevent erosion; and
- Installing a series of offshore breakwaters to dissipate wave action that is causing the bank loss. Establish marsh grasses in filled areas landward of the breakwaters.

Once specific site plans are developed, a federal consistency review and appropriate wetlands permits from VDEQ, USACE, and Virginia Marine Resources Commission and comments from VDCR will be required prior to implementation.

6.2.2 IRP Site Maintenance

Two IRP sites at CAX (Sites 1 and 4) that require regular maintenance by natural resources staff are located in Administrative and Operational Management Unit (Figure 4-2). Maintenance

actions required at these sites include monitoring and correcting erosion problems and maintaining access roads to the sites.

6.2.3 Grounds Maintenance and Urban Forestry

Grounds maintenance practices in the Administrative and Operational Management Unit include mowing and tree and shrub care in landscaped areas. Reducing excessive mowing, which occurs throughout much of the unit, would improve wildlife habitat value and water retention and absorption, and reduce the cost of grounds maintenance. Current landscaping relies heavily on crepe myrtle (*Lagerstroemia indica*). Adding a variety of native trees such as dogwood, redbud, and American holly and shrubs such as viburnums and blueberries would increase the area's visual interest, increase wildlife value, and make the area less sensitive to disease and insect infestations. Reforestation of areas that are no longer used for operational purposes would also reduce grounds maintenance costs in the area. Qualified, trained personnel or tree care contractors will conduct care and maintenance of ornamental plantings. Station natural resources staff will continue to oversee grounds maintenance and tree care contracts and will provide training as needed.

Several of the Station's forest stands (forest compartments 3 and 4) are located within this management unit. Management needs within these stands is minimal. Pine-dominant stands will continue to be monitored for southern pine beetle activity, and any tree creating a health or safety hazard will be attended to promptly. An urban forest management plan that identifies such problem trees and other urban forest issues would help improve tree care on the Station.

6.2.4 Pest Management

Canada geese are a nuisance species that create problems around Penniman Lake and grassy areas of the golf course. Geese can foul administrative areas with their droppings and can damage golf greens as they forage. If geese are determined to be a problem and harassment measures are planned, the Station natural resources staff will obtain an appropriate depredation permit and coordinate efforts with APHIS-WS and VDGIF.

6.2.5 Cultural Resources Protection

Nine of the Station's archaeological sites that are potentially eligible for inclusion on the NRHP occur within this management unit. Two of the sites occur on built-up sites that are paved or otherwise developed. The remaining sites are in forested or mowed areas and have the potential to be intact. Until further site surveys are conducted to determine if these sites are eligible for inclusion on the NRHP, cultural resources maps and the Station HARPP will be consulted prior to conducting ground-disturbing activities in these areas.

6.3 Jones Millpond Management Unit

The Jones Millpond Management Unit encompasses 406 acres, which include the 45-acre Jones Millpond Reservoir and the surrounding forested area. Most of the management unit is comprised of steep slopes on deeply cut ravines with soils that have a moderate to severe erosion hazard. Natural resources management topics for this management unit include:

- Wetlands and water quality protection;
- Forest management;
- Fish and wildlife management;
- Outdoor recreation;
- Threatened and endangered species protection
- Pest management; and
- Cultural resources protection.

6.3.1 Wetlands and Water Quality Protection

Jones Millpond is a major freshwater resource at CAX and water quality is an important natural resources for this management unit. To protect the watershed, development and other disturbances are largely excluded from this management unit. Though timber harvesting and forest management do occur, a 100-foot buffer landward of all wetlands is protected from these activities. Planning-level wetland delineation information will be referenced if any management activities are planned for this management unit.

6.3.2 Forest Management

Timber harvesting and management activities have occurred over the last 15 to 20 years in this management unit (i.e., forest compartment 1). The stands are comprised of 50- to 90-year-old hardwoods and sapling to pole sized pines and hardwoods. Hardwood-dominant stands will be left to grow to develop structural complexity, including large-diameter trees and other old-growth characteristics. Further thinning and selective cuts may be required to release desired species and crop trees in the younger, mixed stands. State-approved BMPs that protect water quality will be practiced during any timber harvesting activity.

6.3.3 Fish and Wildlife Management

As with the Undeveloped Areas Management Unit, the Jones Millpond tract is an important part of a contiguous block of forested habitat at CAX and surrounding lands. Forests will be managed to maintain the current dominance of oaks and to minimize fragmentation and creation of edge habitat.

As with other hunting areas, the white-tailed deer population will continue to be managed at a level consistent with the Station's biological carrying capacity. Natural resources staff will continue to cooperate with VDGIF to set annual hunting seasons and bag limits at the Station. Annual harvest records will continue to be collected, summarized, and reported to VDGIF to help assess deer population levels and herd condition. Turkey harvest information will continue to be included on harvest data forms at CAX to provide valuable population information for the continued management of these populations.

Jones Millpond will continue to be managed as a recreational freshwater fishery. The ban on pesticides used to control algae should continue to improve fish populations. Fisheries surveys have showed that largemouth bass were abundant, but undersized and in poor condition. Very few forage species were found to be present in Jones Millpond and could be the cause of the poor condition. Stocking with forage fish species such as gizzard shad and golden shiner could temporarily improve conditions. Additionally, constructing fish structures (e.g., artificial reefs, brush piles) could provide greater protection for the forage species that do occur. Updated fisheries surveys should be obtained for Jones Millpond every three years to help assess fish populations.

6.3.4 Outdoor Recreation

Hunting and fishing are popular recreational pursuits in the Jones Millpond Management Unit. Small game, turkey, and deer are hunted in the area. Nine deer hunting areas (i.e., Areas 1 through 9), which can accommodate 11 hunters, and two turkey areas (i.e., Areas A and B), which can accommodate two turkey hunters, are in this management unit. Hunting Areas 2 and 3 are reserved for a disabled hunter and an assistant. Eleven deer stands are currently in the management unit. All have recently been replaced with new pressure-treated stands.

Bank fishing is not permitted on Jones Millpond; however, a dock with rental boats, available through MWR, offers the recreational fisherman access to the pond.

6.3.5 Threatened and Endangered Species Protection

Natural heritage resources documented in this management unit include a bald eagle nest site first observed in 2002, the state-rare moth Franck's sphinx, and a small population of bog twayblade that was last observed in 1997. The eagle and moth sites are located in the Jones Millpond Ecological Area (Figure 2-10), which was delineated in 2003 by VDCR-DNH to provide protection for these two species. USFWS and VDGIF guidelines concerning the protection of bald eagles will be followed in the eagle protection zones. The bog twayblade is in a portion of the Lower Queen Creek Ecological Area that overlaps into this management unit (Figure 2-10). Though it is unknown if the bog twayblade still occurs on the site, logging and other ground-disturbing activities will not be conducted in this portion of the management unit.

6.3.6 Pest Management

Beavers inhabiting the forested watershed around Jones Millpond often build dams that cause flooding of the perimeter road. At times, the natural resources manager has had to remove debris to unclog these structures every two weeks or so. If beavers continue to be a problem, a beaver exclusion device that prevents debris from clogging drainage structures will be installed or lethal control methods will be employed. Live trapping and relocating is discouraged unless a suitable habitat with no existing beaver population is available.

Mute swans are another potential nuisance species in this management unit. Two mute swans were observed on Jones Millpond during a 2002 waterfowl survey. Populations of this aggressive nonnative species will be monitored and controlled if they are determined to be a significant problem. Natural resources managers should continue to document and inventory

invasive plant species at this management unit and provide an IPM approach to their control and eradication.

6.3.7 Cultural Resources Protection

Five archeological sites that are potentially eligible for listing on the NRHP are located in this management unit. These sites will be noted on site planning maps and avoided during any activity that has the potential to impact archaeological resources.

7.0 YFT NATURAL RESOURCE MANAGEMENT UNIT

Due to the small area and lack of natural resources at YFT, the entire area is designated as a single management unit. The primary natural resource management topics at YFT are:

- Wetlands and water quality protection
- Grounds maintenance and urban forestry

7.1 Wetlands and Water Quality Protection

The storage and transfer of large quantities of fuel at YFT create the potential for spills and fuel leaks, which constitute the greatest potential threats to wetlands and water quality. Oil spill response is the responsibility of the FIC. For instances beyond the capability of the Installation Commander, the NOSC representative will assume the role of FIC. Spill response procedures are detailed in the YFT SPCCP and OHSFRP. These plans are followed as the primary spill response policies.

To avoid impacts to wetlands, proponents of any future construction or land-disturbing actions should consult the Station's most recent wetland information (Figure 2-6), including the Chesapeake Bay RPAs and RMAs. Current Station wetland, RPA, and RMA information remains at the planning level and site-specific delineation and state, county, and federal jurisdiction and approval must be sought prior to beginning any activities that have the potential to impact these areas. The Station natural resources manager will continue to review erosion and sedimentation plans and oversee construction and demolition work that has the potential to impact water quality.

Hardened drainage ditches tend to concentrate and increase the storm water velocity and have led to surface erosion problems and undercutting at outfalls at YFT. This is a common problem in developed areas when a large surface area is drained by a small or ineffective drainage system. Hardening these outfall areas with riprap and restoring (e.g., regrade and seed) the eroded areas have been determined to be temporary remedies at YFT. However, implementing storm water BMPs such as creating storm water retention ponds or other innovative storm water control measures that retain storm water on site to slow runoff speed and reduce quantity may offer more permanent solutions.

7.2 Grounds Maintenance and Urban Forestry

The YFT landscape consists of large open areas of mowed lawn that overlie the terminal's underground storage tanks and rows of mature eastern red cedar that line access roads. Natural resources staff will provide oversight of grounds maintenance contracts to prevent unnecessary mowing along roadways and will require posting "No Mowing" signs as necessary. Natural resources managers are also to ensure roadside vegetation is maintained, unnecessary mowing is reduced, fertilizers and pesticides are controlled, and native plants are used within this management unit.

8.0 INRMP IMPLEMENTATION

8.1 Project Development and Classification

This INRMP is a public document that requires the mutual agreement of the Station, USFWS, and state fish and wildlife agencies. It is crucial therefore, that these entities reach a common understanding as to which projects are most likely to be funded through the sources identified in Section 8.2. An annual strategy must be adopted for INRMP funding that addresses the Station's legal requirements. The Navy programming hierarchy is described in Section 8.1.1 and Project Classification is described in Section 8.1.2.

8.1.1 Project Development and Classification

The Navy programming hierarchy is based on the following DoD funding level classifications.

- **Class 0: Recurring Natural Resources Conservation Management Requirements.** Includes activities needed to cover the recurring administrative, personnel, and other costs associated with managing DoD's conservation program that are necessary to meet applicable compliance requirements (federal and state laws, regulations, presidential executive orders, and DoD policies) or which are in direct support of the military mission.

- **Class I: Current Compliance.** Includes projects and activities needed because an installation is currently out of compliance (has received an enforcement action from a duly authorized federal or state agency, or local authority); has a signed compliance agreement or has received a consent order, or has not met requirements based on applicable federal or state laws, regulations, standards, presidential executive orders, or DoD policies, and/or are immediate and essential to maintain operational integrity or sustain readiness of the military mission. "Class I" also includes projects and activities needed that are not currently out of compliance (deadlines or requirements have been established by applicable laws, regulations, standards, DoD policies, or presidential executive orders, but deadlines have not passed or requirements are not in force) but shall be if projects or activities are not implemented in the current program year.

- **Class II: Maintenance Requirements.** Includes those projects and activities needed that are not currently out of compliance (deadlines or requirements have been established by applicable laws, regulations, standards, presidential executive orders, or DoD policies, but deadlines have not passed or requirements are not in force), but shall be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year.

- **Class III: Enhancement Actions Beyond Compliance.** Includes those projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or executive order and are not of an immediate nature.

The Navy funding classification of recurring and non-recurring projects consists of the following four ERLs. The following descriptions of each ERL are presented in decreasing order of priority with ERL 4 having the highest priority as must fund compliance projects through ERL 1 representing environmental stewardship projects.

Environmental Readiness Level 4:

- Supports all actions specifically required by law, regulation or Executive Order (DoD Class I and II requirements) just in time;
- Supports all DoD Class 0 requirements as they relate to a specific statute such as hazardous waste disposal, permits, fees, monitoring, sampling and analysis, and reporting and record keeping;
- Supports recurring administrative, personnel and other costs associated with managing environmental programs that are necessary to meet applicable compliance requirements (DoD Class 0);
- Supports DoD policy requirement to comply with overseas Final Governing Standards (FGS) and Overseas Environmental Baseline Guidance Document (OEBGD); and,
- Supports minimum feasible Navy executive agent responsibilities, participation in Office of the Secretary of Defense (OSD) sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts.

Environmental Readiness Level 3:

- Supports all capabilities provided by ERL 4;
- Supports existing level of Navy executive agent responsibilities, participation in OSD sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts;
- Supports proactive involvement in the legislative and regulatory process to identify and mitigate requirements that will impose excessive costs or restrictions on operations and training; and,
- Supports proactive initiatives critical to the protection of Navy operational readiness.

Environmental Readiness Level 2:

- Supports all capabilities provided under ERL 3;
- Supports enhanced proactive initiatives critical to the protection of Navy operational readiness;
- Supports all Navy and DoD policy requirements; and,
- Supports investments in pollution reduction, compliance enhancement, energy conservation and cost reduction.

Environmental Readiness Level 1:

- Supports all capabilities provided under ERL 2;
- Supports proactive actions required to ensure compliance with pending/strongly anticipated laws and regulations in a timely manner and/or to prevent adverse impacts to the Navy mission; and,
- Supports investments that demonstrate Navy environmental leadership and proactive environmental stewardship.

8.1.2 Project Classification

The list of projects described in this INRMP consist of both "must fund," compliance-type projects and stewardship-type projects. "Must fund" conservation requirements are those projects and activities that are required to meet recurring natural and cultural resources conservation management requirements or current legal compliance needs, including EOs. These projects are designated ERL 4 or 3 in the Navy funding classification system, described in Section 8.1.2. "Must fund" or ERL 4 or 3 projects could include:

- Developing, updating, and revising INRMPs;
- Salaries and annual training of professional personnel, in accordance with Individual Development Plans (IDP), involved in the development and implementation of INRMPs;
- Terms and conditions of Biological Opinions issued by USFWS or National Marine Fisheries Services (NMFS);
- Baseline surveys to keep INRMPs current;
- Biological surveys to determine population status of endangered, threatened and sensitive species;
- Survey and monitoring programs to support the MBTA and related permits;
- Wetland surveys for planning, monitoring and/or permit applications;
- Erosion control measures required to remain in compliance with natural resources protection regulations and to maintain land condition for realistic training operations;
- Support of leadership roles or executive agent responsibilities for the Coastal America, Coral Reef Protection, Chesapeake Bay, and Mojave Desert Ecosystem Management Initiative; and,
- Memorandums of Agreement/Understanding (MOA/MOU) commitments.

This list is not meant to be all-inclusive, but is meant to provide an overview of the types of projects that could be classified as compliance or must fund projects.

INRMP projects are developed based on the unique circumstances facing an installation, and INRMPs should include only valid projects and programs that enhance an installation's natural resources, promote proactive conservation measures, and support investments that demonstrate

Navy environmental leadership and proactive environmental stewardship. These projects are considered "stewardship" projects and fall under ERL 1 or 2 in the Navy classification system. Examples of stewardship projects include, but are not limited to:

- Community outreach activities, such as Earth Day and Migratory Bird Day activities;
- Education and public awareness projects such as interpretive displays, oral histories, watchable wildlife areas, nature trails, wildlife checklists, and conservation teaching materials;
- Biological surveys or habitat protection for non-listed species;
- Management and execution of volunteer and partnership programs;
- Demonstration plantings of native plant materials;
- Experimental conservation techniques;
- Agriculture outlease improvements;
- Forest stand improvements and other management efforts; and,
- Wildlife management efforts.

All INRMP Projects must be entered into the EPR-web system and receive approval up the chain of command prior to soliciting any signatures on the INRMP. CNO N45 is the final authority for designating the appropriate ERL for a given INRMP Project.

8.2 Funding Sources

Operations and Maintenance, Navy (O&MN) environmental funds are the primary sources of resources to support Navy Level 1 (OMB/EPA Classes 0, I, and II) actions, though these funds are generally not available for Navy Level 2 through 5 actions. In addition, only the initial procurement, construction, or modification of a facility or project is a valid use of O&MN funds. The subsequent operation and maintenance is considered a Real Property Maintenance funding requirement. When natural resources actions are required as part of a military construction (MILCON) project, costs should be paid by MILCON funds as part of the overall construction project.

Forestry revenues from the sale of forest products on Navy lands are a source of funding for two different funding programs; Annual Navy Forest Funds and DoD Forestry Reserve Account. The DoD Forestry Reserve Account funds can be used for improvement of forestlands and for implementation of projects in an approved management plan that provides for habitat improvement and protection. These funds are suitable for many of the types of natural resources management projects identified in this INRMP. Revenues collected through the leasing of Navy land for agricultural use, which have been available for a broad range of uses in the past, may now only be available to natural resources programs with agricultural income. User fees collected from Station fishing and hunting programs may be used only for the protection, conservation, and management of fish and wildlife such as habitat improvement and related activities. The Legacy Resources Management Program (Legacy) can provide funding for a

variety of conservation projects such as habitat preservation efforts and ecosystem management efforts. A project proposal must be submitted to be eligible for Legacy funds.

The Legacy website offers guidance on the proposal process: https://www.denix.osd.mil/portal/page/portal/content/environment/NR/lrmp/LEGACY_GUIDEBOOK.DOC.

8.3 Use of Cooperative Agreements

A cooperative agreement is used to acquire goods or services, or stimulate an activity that will be implemented for the public good. Section 103a of the Sikes Act (16 U.S.C. 670c-1) provides the authority to enter into cooperative agreements with state and local governments, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources on, or to benefit natural and historic research on, DoD installations. In addition to a standard cooperative agreement, examples of other agreements include Memorandum of Understanding, and Cooperative Assistance Agreement. Funds appropriated for multiyear agreements during a fiscal year may be obligated to cover the cost of goods and services provided under a cooperative agreement entered into or through an agency agreement under section 1535 of Title 31 during any 18-month period beginning in that fiscal year, without regard to whether the agreement crosses fiscal years. Cooperative agreements entered into are subject to the availability of funds.

EO 13352, Facilitation of Cooperative Conservation (August 26, 2004) directs that the Secretaries of the Interior, Agriculture, Commerce, and Defense and the Administrator of the EPA shall, to the extent permitted by law and subject to the availability of appropriations and in coordination with each other as appropriate: carry out the programs, projects, and activities of the agency that they respectively head that implement laws relating to the environment and natural resources in a manner that facilitates cooperative conservation; take appropriate account of and respects the interests of persons with ownership or other legally recognized interests in land and other natural resources; properly accommodate local participation in Federal decision making; and provides that the programs, projects, and activities are consistent with protecting public health and safety.

The Station does not currently have any cooperative agreements in place

8.4 Project Implementation Schedule

For prioritization and budgeting purposes, each action or project recommended in this INRMP is listed in Table 8-1. The prime legal drivers, as described in the Natural Resources Management Issues Section of this INRMP, programming and budgeting priority, cost estimate, potential funding source, and completion schedule are identified for each project or action. Cost estimates may represent annual expenditures for the Station natural resources manager other technical support for planning, coordinating, and implementing activities or the cost of materials, personnel, and/or contractors associated with a project. All projects submitted for O&MN funding must be included in this INRMP or a clear justification for their omission must be provided. An INRMP annual increment addendum must be prepared annually to facilitate implementation of the

INRMP. The annual increment addendum should provide concise detail and cost estimates of proposed work or projects planned for each fiscal year. Project implementation is contingent on funding availability. Relevant legal drivers and initiatives that were identified for each management issue in this INRMP are also summarized in the project table. Primary statutes and regulations identified in the project table include the federal CWA, SAIA, ESP, NEPA, and MBTA; state conservation laws; DoN and DoD instructions and policies; and presidential EOs.

Table 8-1. Naval Weapons Station Yorktown Natural Resources Schedule, 2010-2020

Project #	Project Description	INRMP Page Ref.	Implementation Schedule[1] (FY)	Legal Diver/ Initiative[2]	Class[3]	Navy Assessment Level[4]	Cost Estimate	Fund Sources[5]	Date Competed
	Wetlands/Water Quality Protection								
	Develop and implement site-specific erosion control plans on the York River at CAX for:	5-5		A, B, C, G, H, I, Q	I	1			
1	Site 1		2011				$160,000	O&MN	
2	Site 2		2011				$160,000	O&MN	
3	Site 3		2011				NA	DERA	
4	Site 4		2011				$160,000	O&MN	
5	Site 7		2011				$100,000	O&MN	
6	BLD 1834 (4 acres)		2012				$600	O&MN	
7	Group 5 (3 acres)		2011				$500	O&MN	
8	Group 6 (2 acres)		2011				$300	O&MN	
9	Group 7 (3acres)		2011				$400	O&MN	
10	Group 8 (2 acres)		2012				$300	O&MN	
11	Group 9 (2 acres)		2012				$300	O&MN	
12	Group 10 (3acres)		2013				$400	O&MN	
13	Group 11 (2 acres)		2013				$300	O&MN	
14	Replace Aged Equipment		2012 & 2013				$70,000	O&MN, AG, Forestry	
	Urban Forestry, Soils and Grounds Maintenance								
15	Develop a scope of work and get funding for an Urban Forest Management Plan.	4-8	2011	P, S, T	II	2	$50,000	AG/FR	
16	Replace trees that are removed for safety or health reasons with appropriate native species.	3-13	As needed	P, S, T, X	II	2	$1,200	FOR	
	Habitat Conservation and Restoration								
	Plan and Implement Demolition Site Restorations for the following sites:	3-19		A, B, C, G, I	II	1		SAIA FOR	
17	NEX/Commissary Complex (17 acres)		2012				$7,000		
18	Air Launch Complex (18 acres)		2012				$1,000		

19	Holm Road Complex (3 acres)		2011				$1,500		
20	Group 16 Complex (2 acres)		2011				$250		
21	Plant One Complex (11 acres)		2012				$1,000		
22	Plant Three Complex (24 acres)		2011 & 2012				$2,000		
23	Sharpes Road Complex (22 acres)		2012				$7,000		
	Forestry								
24	Post signs and block unnecessary roads in remote areas at CAX and WPNSTA.	5-4	2011 & 2012	A, B, C, O	III	2	$2,000	O&MN	
25	Assess forest stands for stand thinning and harvesting. Update forest stand table.	4-4 5-3	Recurring	A, B, C	0	2	NA	NA	
26	Schedule and conduct forest operations as necessary.	4-4 5-3	Recurring	A, B, C	III	2	$50,000	FOR	
27	Conduct prescribed burning on select forest stands.	4-4	Recurring	A, B, C	III	2	$2,500	FOR	
	Invasive Species Control								
28	Conduct invasive species control on identified sites.	4-6	Recurring	A, B, C, M	II	1	$10,000	O&MN	
	Threatened and Endangered Species Protection								
29	Manually thin pine stands adjacent to the depression ponds (Mabee's salamander habitat) to encourage the establishment of hardwoods.	3-56	2011-2012	A, B, C	III	2	$5,000	AG/FR	
	Fish and Wildlife Management								
30	Update fisheries surveys of Ponds 10, 11, and 12, Roosevelt Pond, Penniman Lake and Jones Millpond every three years.	3-43	2011, 2014, 2017	N	II	1	$10,000	SAIA	
	Install or replace water control structures at:	5-4		E, N	III	2		AG, FR	
31	Pond 10		2011				$20,000		
32	Pond 11		2012				$20,000		
33	Pond 12		2013				$20,000		
34	Roosevelt Pond		2010				$60,000		
	Outdoor Recreation and Environmental Awareness								
35	Replace older hunt stands at a rate of about 25 stands per year at WPNSTA.	4-5	2011-2014	E	III	2	$2,000	SAIA	

	Natural Resources Training								
36	Attend annual law enforcement refresher courses.	4-6	Annual	A, B, C	0	1	NA		
37	Complete Combined Administrator for Erosion and Sediment Control certification.	3-5	2010	A, B, C	0	2	NA		
38	**Develop a 5-year update to the INRMP**	8-1	2020	A, B, C, E	II	1	$68,000	SAIA	

[1]Implementation/Completion Project Frequency: Annual=1 day/year; Recurring=2-20 days/year, usually one season; On going=every year, multi season activity
[2]Legal Divers and Initiatives:

A OPNAVINST 5090.2B Ch. 3
B DoD Instruction 4715.3, Environmental Conservation Program
C 32CFR190, Natural Resources Management Program
D Migratory Bird Treaty Act
E Sikes Act Amendment Act
F Endangered Species Act
G Clean Water Act
H Coastal Zone Management Act
I Soil and Water conservation Act
J National Environmental Policy Act
K Executive Order 11990, Protection of Wetlands
L Executive Order 11988, Floodplain Management
M Executive Order 13112, Invasive Species
N Executive Order 12962, Recreational Fisheries
O Executive Order 11989, Use of Off- Road Vehicles on the Public Lands
P Executive Order 13148, Greening the Government through Leadership in Environmental Management
Q Chesapeake Bay Agreements
R CNO Guidance of Feral Cats and Dogs
S Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds
T Regional Tree Preservation and Replacement Instruction

[3] Class 0: recurring staff costs; Class I: current compliance; Class II: maintenance requirements; Class III: enhancement actions beyond compliance
[4] Navy Assessment Level: Level 1=legal requirement; Level 2=Navy policy; Level 3=pending regulation, Level 4=future requirement, Level 5=leadership initiative
[5] Fund Source: O&MN=Operations and Maintenance, Navy; SAIA=Sikes Act Revenues; FOR=Navy Forestry; FR=DoD Forestry Reserve; AG=Agricultural Outlease, LP=Legacy Program, NWCF=Navy Working Capital Fund; DERA=Defense Environmental Restoration Account
NA = Not Applicable

9.0 INRMP ANNUAL UPDATE

This INRMP is valid for a 10 year period from 2010 to 2020 and is required to be updated annually (DoDI 4715.3). Updates and revisions are a necessary to maintain a proactive management plan. Natural ecosystems and anthropogenic settings are dynamic, therefore management goals and objectives require prescribed monitoring to be responsive and measure success or failure. Observations, testing, and results provide the knowledge base by which sound revisions can be recommended. The section below may be used to document changes to the plan that will improve natural resources management. It is intended to document annual updates, and it is not intended to replace the five-year review and revision process. Annual updates will provide information that will be incorporated into the five-year update. Each entry in this section should reference the plan section and page number that is being updated to facilitate cross-referencing.

DATE	SECTION/PAGE	COMMENT	REVIEWER

DATE	SECTION/PAGE	COMMENT	REVIEWER

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APPENDIX A

Environmental Assessment

DEPARTMENT OF DEFENSE
DEPARTMENT OF THE NAVY

(EA) and Finding of No Significant Impact (FONSI) have been prepared for the development and implementation of an Integrated Natural Resources Management Plan (INRMP) for Naval Weapons Station (NWS) Yorktown, including Cheatham Annex (CAX) and Yorktown Fuel Terminal

Pursuant to the Council on Environmental Quality regulations (40 Code of Federal Regulations § 1500-1508) implementing procedural provisions of the National Environmental Policy Act (NEPA), the Department of the Navy, gives notice that an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) have been prepared for the development and implementation of an Integrated Natural Resources Management Plan (INRMP) for Naval Weapons Station (NWS) Yorktown, including Cheatham Annex (CAX) and Yorktown Fuel Terminal (YFT) and an Environmental Impact Statement (EIS) is not being prepared.

Proposed Action:
The proposed action (Alternative 2) is to develop and implement an INRMP consistent with the military use of the property and the goals and objectives established in the SAIA. The goal of the INRMP is to implement an ecosystem based natural resources program that provides for conservation of natural resources in a manner that is consistent with the military mission; integrates and coordinates all natural resources management activities; provides for sustainable multipurpose uses of natural resources; and provides for public access for use of natural resources subject to safety and military security considerations. The proposed INRMP would address and implement land management, forest management, fish and wildlife management, outdoor recreation, cultural resources protection, conservation education, and natural resources program administration. A total of 30 ongoing and new management actions and projects are proposed to meet compliance and stewardship objectives for natural resources management at the installations.

Existing Conditions:
Impacts to relevant resources that were evaluated for each alternative included land use, soil resources, wetlands and water quality, coastal zone resources, vegetation, wildlife, threatened and endangered species, cultural resources, air quality, environmental justice and socioeconomics.

Alternatives Analyzed:
The no action alternative (Alternative1) is the continued implementation of the management objectives and practices specified in the natural resources plans for the weapons station (U.S. Navy 1996) and CAX/YFT (U.S. Navy 1999b). The existing management plans provide valuable information on natural resources management; however, the plans do not set time frames for implementation of or provide cost estimates for natural resources projects. Also, many of the project management recommendations provided in the current natural resources plans have been completed, and new projects described in the proposed INRMP would not be implemented under this alternative. In addition, no EA was completed for development of the existing plans, nor were they provided for public review. Consequently, the existing plans do not meet the SAIA requirements for an INRMP. The no action alternative is carried forward as a baseline for comparison to the other alternatives as required by CEQ regulations.

(EA) and Finding of No Significant Impact (FONSI) have been prepared for the development and implementation of an Integrated Natural Resources Management Plan (INRMP) for Naval Weapons Station (NWS) Yorktown, including Cheatham Annex (CAX) and Yorktown Fuel Terminal

Environmental Effects:
(EA) and Finding of No Significant Impact (FONSI) have been prepared for the development and implementation of an Integrated Natural Resources Management Plan (INRMP) for Naval Weapons Station (NWS) Yorktown, including Cheatham Annex (CAX) and Yorktown Fuel Terminal (YFT) and an Environmental Impact Statement (EIS) is not being prepared.

This EA demonstrated that implementation of the proposed action would result in no impact, positive impacts, or minimal negative impacts to environmental resources. The greatest potential negative impact would be from annual prescribed burning, which has the potential to increase air emissions. However, benefits from prescribed burning, including reducing the risk of catastrophic wildfire and managing early successional habitat, which is important to a number of wildlife species on the bases, would also be provided. Additionally, impacts to air quality would be minimized through the use of proper smoke management procedures and optimizing the burning schedule. Because NWS Yorktown is in a maintenance area for ozone, an applicability analysis is required under the General Conformity Rule of the CAA. The applicability analysis provided in the EA demonstrates under both alternatives emissions from prescribed burning would be well below *de minimis* levels for annual criteria pollutant emissions.

Findings: Based on information gathered during preparation of the EA, the Department of the Navy finds that implementing the proposed action will not significantly impact the quality of the environment. The EA and FONSI addressing this action may be obtained by interested parties by contacting Commander, Naval Facilities Engineering Command Atlantic, 6506 Hampton Blvd., Norfolk, Virginia 23508-1278. (Attn: Mr. Jack Markham), telephone (757) 322-4882. A limited number of copies of the EA are available to fill single copy requests.

NOV 29 2004

Date

C. E. WEAVER
Rear Admiral, U. S. Navy
Commander, Navy Installations Command

ENVIRONMENTAL ASSESSMENT
FOR THE
IMPLEMENTATION OF AN
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FINAL

NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX AND YORKTOWN FUEL TERMINAL

Prepared for:
Atlantic Division
Naval Facilities Engineering Command

SEPTEMBER 2004

EXECUTIVE SUMMARY

This Environmental Assessment (EA) analyzes the potential environmental consequences resulting from the proposed implementation of the proposed Integrated Natural Resources Management Plan (INRMP) at Naval Weapons Station (NWS) Yorktown. NWS Yorktown is a complex of three formerly separate activities, the weapons station (WPNSTA), Cheatham Annex (CAX), and Yorktown Fuel Terminal (YFT). The environmental analysis process is designed to ensure the public is involved in the process and informed about the potential environmental effects of the proposed action; and to help decision makers take environmental factors into consideration when making decisions related to the proposed action.

Purpose and Need for the Proposed Action

The purpose of this action is to implement a conservation program that integrates fish and wildlife management, land management, and management of outdoor recreational opportunities, as practicable and consistent with the military mission and planned mission activities.

The need for this action is to meet statutory requirements under the Sikes Act Improvement Act (SAIA). In November 1997, the Sikes Act, 16 U.S. Code (USC) § 670a et seq., was amended to require the Secretary of Defense to prepare and implement INRMPs for each military installation in the United States, unless the absence of significant natural resources on a particular installation makes preparation of a plan for that installation inappropriate.

Proposed Action and Alternatives

NWS Yorktown proposes to develop and implement an INRMP consistent with the military use of the property and the goals and objectives established in the SAIA. The goal of the INRMP is to implement an ecosystem-based natural resources program that provides for conservation of natural resources in a manner that is consistent with the military mission; integrates and coordinates all natural resources management activities; provides for sustainable multipurpose uses of natural resources; and provides for public access for use of natural resources subject to safety and military security considerations. The alternative to the proposed action consists of a no action alternative.

Summary of Environmental Consequences

It is expected that there would be temporary minor impacts associated with implementation of the proposed action or the alternative. A summary of the potential impacts is contained in Table ES-1.

Table ES-1. Comparison of Alternatives.

Resource	Alternative 1 No Action	Alternative 2 Preferred Action
Land Use	No change	Positive effects on the Station's ability to sustain military land use
Soil Resources	No change	Positive effects from review of soil erosion and control plans and recommended project implementation
Water Resources	No change	Positive effects from project implementation that protects, conserves, and enhances water resources
Coastal Zone Resources	No change	Positive effects from enhancing riparian forest buffers and installing shoreline protection measures
Vegetation	No change	Positive effects from forest management activities and invasive species control
Wildlife	No change	Positive effects from game and nongame management, habitat enhancements, deer population control, pond improvements, and integration of overall ecosystem management
Threatened and Endangered Species	No change	Positive effects from rare species surveys and protecting and enhancing rare species habitat
Cultural Resources	No change	Positive effects from integration with the cultural resources management plans
Air Quality	No change	Minimal effect from emissions; action is in conformity with State Implementation Plan
Socioeconomics	No change to population, income, or employment	No change to population, income, or employment
Environmental Justice	No disproportionately high adverse impact on minority or low-income populations	No disproportionately high adverse impact on minority or low-income populations

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LIST OF ACRONYMS AND ABBREVIATIONS

BEA	Bureau of Economic Analysis
BMP	best management practice
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAX	Cheatham Annex
CEQ	Council on Environmental Quality
CCD	coastal zone consistency determination
CFR	Code of Federal Regulations
CH_4	methane
CNHP	Colonial National Historical Park
CNO	Chief of Naval Operations
CO	carbon monoxide
CRMP	Coastal Resources Management Program
CWA	Clean Water Act
DMAP	Deer Management Program
DoD	Department of Defense
DoD INST	Department of Defense Instruction
EA	environmental assessment
EIS	environmental impact statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESQD	explosives safety quantity distance
FONSI	finding of no significant impact
GMI	Geo-Marine, Inc.
HARPP	Historic and Archaeological Resources Protection Plan
ICRMP	integrated cultural resources management plan
INRMP	integrated natural resources management plan
IRP	Installation Restoration Program
MBTA	Migratory Bird Treaty Act
MILCON	military construction
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_x	nitrous oxides
NO_2	nitrogen dioxide
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWS	Naval Weapons Station
O_3	ozone
OPNAVINST	Chief of Naval Operations Operating Instruction
Pb	lead
PM_{10}	particulate matter less than 10 micrometers

LIST OF ACRONYMS AND ABBREVIATIONS (cont'd)

Ppm	parts per million
RLMP	Regional Land Management Plan
ROI	region of influence
RSIP	Regional Shore Infrastructure Plan
SAIA	Sikes Act Improvement Act
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxide
USC	U.S. Code
USCB	U.S. Census Bureau
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VDCR-DNH	Virginia Department of Conservation and Recreation-Division of Natural Heritage
VDGIF	Virginia Department of Game and Inland Fisheries
VDOF	Virginia Department of Forestry
VOC	volatile organic compound
WPNSTA	weapons station
YFT	Yorktown Fuel Terminal

1.0 PURPOSE AND NEED FOR ACTION

1.1 Introduction

Naval Weapons Station (NWS) Yorktown is a complex of three formerly separate activities, the weapons station (WPNSTA), Cheatham Annex (CAX), and Yorktown Fuel Terminal (YFT), which were brought under the administration of NWS Yorktown in 1998 and 1999 during a regional realignment of naval installations. All three parcels are on Virginia's Lower Peninsula between the York River and James River (Figure 1-1). The largest parcel, WPNSTA, encompasses approximately 10,320 acres in York and James City counties and the City of Newport News. The Colonial Parkway and Colonial National Historical Park (CNHP) bound the Station to the north, northwest, and east, and Interstate 64 bounds the Station to the south and southwest. CAX encompasses 1,512 acres to the northwest of WPNSTA and is located entirely within York County. CNHP, Williamsburg Battlefield, and the Virginia Department of Emergency Services are the properties adjoining CAX. YFT is a 138-acre parcel to the southeast of WPNSTA and is also located within York County. It is bounded by the U.S. Coast Guard Reserve Training Center, the West Branch of Wormley Creek, and CNHP.

WPNSTA currently hosts 25 tenant commands, which include the Atlantic Ordnance Command, Naval Ophthalmic Support and Training Activity, Marine Corps Second Fleet Anti-Terrorism Security Team, Fleet Industrial Supply Center Detachment, Navy Cargo Handling and Port Group, and 19 storefronts. The Station and tenant commands work together as a team to provide ordnance logistics, technical, supply, and related services to the Atlantic Fleet. The base mission is to provide responsive, quality support for ordnance logistics, technical, and related services to U.S. Operating Forces in support of national military strategy. CAX provides supply support services that include warehousing, inventory management, local delivery, fuel management and distribution, technical support, customer service, and care of sponsor-owned material primarily in support of naval ordnance missions. CAX has 18 warehouses and 10 tenant activities. The mission of YFT is to receive, store, and issue jet petroleum fuel to Defense Logistics Agency customers including Fort Eustis, Virginia, and Langley Air Force Base, Virginia.

1.2 Proposed Action

NWS Yorktown proposes to develop and implement an integrated natural resources management plan (INRMP) consistent with the military use of the property and the goals and objectives established in the Sikes Act Improvement Act (SAIA). The goal of the INRMP is to implement an ecosystem-based natural resources program that provides for conservation of natural resources in a manner that is consistent with the military mission; integrates and coordinates all natural resources management activities; provides for sustainable multipurpose uses of natural resources; maintains compliance with relevant environmental regulations; and provides for public access for use of natural resources subject to safety and military security considerations.

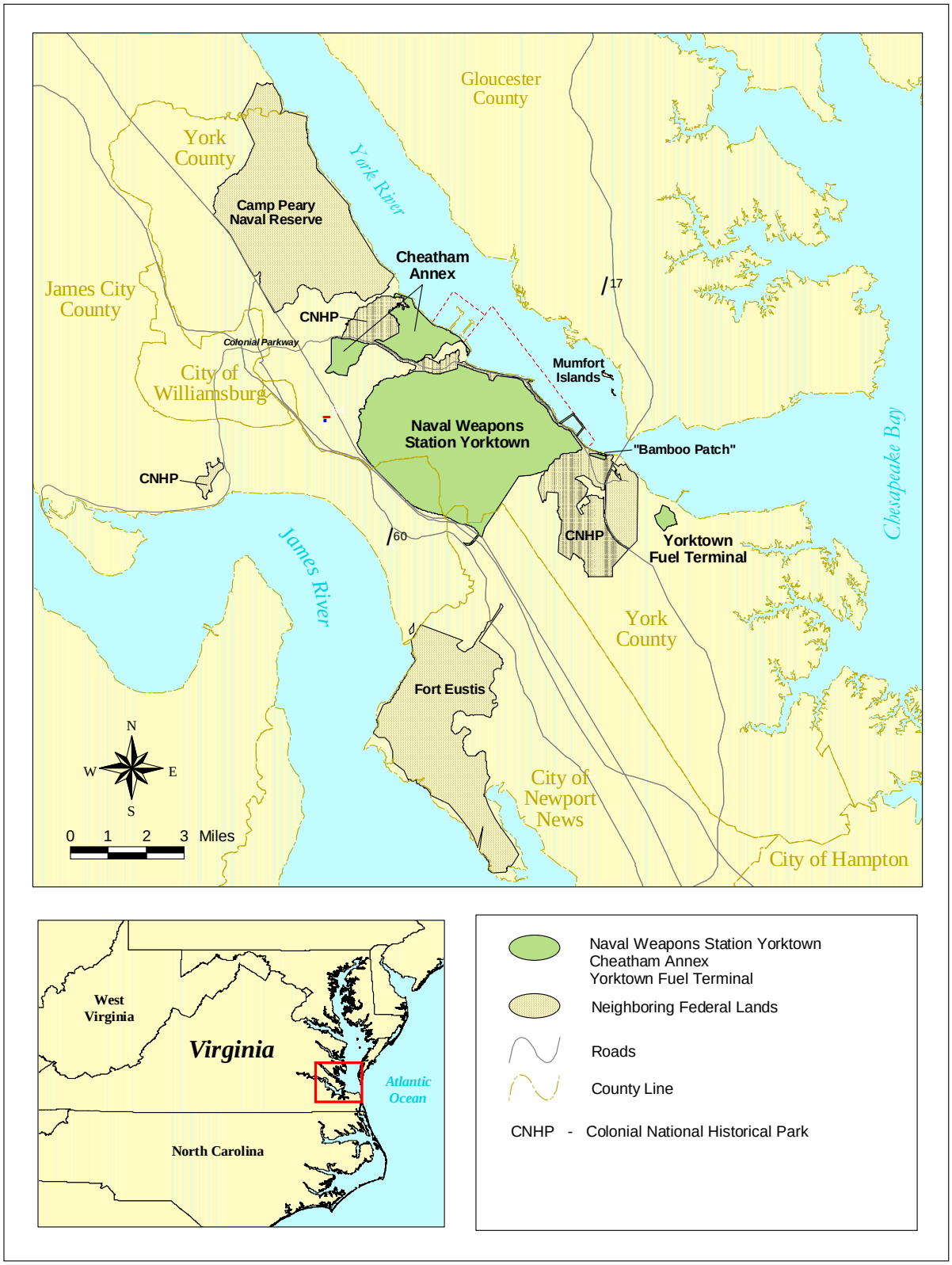

Figure 1-1. Location and Regional Setting of NWS Yorktown.

1.3 Purpose and Need

The purpose of this action is to implement a conservation program that integrates forestry management, fish and wildlife management, land management, and management of outdoor recreational opportunities, as practicable and consistent with the military mission and planned mission activities.

The need for this action is to meet statutory requirements under the SAIA. In November 1997, the Sikes Act, 16 U.S. Code (USC) § 670a et seq., was amended to require the Secretary of Defense to prepare and implement INRMPs for each military installation in the United States, unless the absence of significant natural resources on a particular installation makes preparation of a plan for that installation inappropriate.

The principal use of military installations is to ensure the preparedness of the armed forces. The SAIA requires each installation to prepare an INRMP that provides for the following program management activities, to the extent that such activities are consistent with use of the installation for military preparedness:

- The conservation and rehabilitation of natural resources on the installation;
- The sustainable multipurpose use of the resources, including hunting, fishing, trapping, and nonconsumptive uses;
- Subject to safety requirements and military security, public access to the installation to facilitate such uses; and
- Resource management in support of the military mission.
- As required by the SAIA, the plan must, to the extent appropriate and applicable, provide for:
- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modification;
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;
- Integration of, and consistency among, the various activities conducted under the plan;
- Establishment of specific, natural resources management goals and objectives and time frames for proposed actions;
- Sustainable use by the public of natural resources, to the extent that the use is not inconsistent with the needs of fish and wildlife resources;

- Public access to the military installation that is necessary or appropriate for the sustainable use of natural resources, subject to requirements necessary to ensure safety and military security;

- Enforcement of applicable natural resource laws (including regulations);

- No net loss in the capability of the installation's lands to support the military mission of the installation; and

- Such other activities as the Navy has determined are appropriate.

In preparing this plan, as required by the SAIA, NWS Yorktown has worked in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (VDGIF) so that the plan reflects the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources on the base. Also, as required by the SAIA, the plan has been provided for public comment, and all comments received were taken into account in finalizing the INRMP.

1.4 Regulatory Compliance

This environmental assessment (EA) has been prepared pursuant to Section 102 of the National Environmental Policy Act (NEPA) of 1969, 42 USC § 4231 et seq., and in accordance with the regulations of the Council on Environmental Quality (CEQ) that implement NEPA procedures (40 Code of Federal Regulations [CFR] § 1500-1508), and the Navy Environmental and Natural Resources Program Manual (Chief of Naval Operations Operating Instruction [OPNAVINST] 5090.1B). NEPA requires federal agencies to take into consideration the potential environmental consequences of proposed actions in their decision-making process. The intent of NEPA is to protect the environment through providing an assessment of alternative actions and providing the opportunity for public comment on federal actions that have the potential to impact the environment. The information presented in this document will serve provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI) would be appropriate.

Individual actions identified in the plan may require state and federal review to ensure compliance with major environmental legislation, such as the Endangered Species Act (ESA), Clean Water Act (CWA), Clean Air Act (CAA), Coastal Zone Management Act (CZMA), and National Historic Preservation Act (NHPA). Potential permits, coordination, and environmental protection plans include, but are not limited to, the following:

- CZMA consistency determination;

- Virginia Erosion and Sediment Control Plan;

- Virginia Water Protection Permit Program;

- Virginia Storm Water Discharge Permit for Construction Activities;

- Virginia Coastal Resources Management Program;

- U.S. Army Corps of Engineers (USACE) Wetlands Permit; and
- Virginia Marine Resources Commission Habitat permitting requirements.

An abbreviated list of pertinent regulations and guidance is in Appendix A.

1.5 INRMP Implementation

1.5.1 Programming and Budgeting Priorities

The Office of Management and Budget (OMB) and the Environmental Protection Agency (EPA) require federal agencies to classify natural resources projects in order to assist with programming and budgeting priorities. Department of Defense Instruction (DoD INST) 4715.3, Enclosure 4, provides detailed guidance on programming and budgeting natural resources projects. The priority classifications (Class 0 through Class III) are summarized below.

Class 0: Recurring Natural Resources Conservation Management Requirements. Includes activities needed to cover the recurring administrative, personnel, and other costs associated with managing DoD's conservation program. Recurring costs consist of manpower, training, supplies, hazardous waste disposal, recycling activities, permits, fees, testing and monitoring and/or sampling and analysis, reporting and record keeping, maintenance of environmental conservation equipment, and compliance self-assessments.

Class I: Current Compliance. Includes projects and activities needed because an installation is currently out of compliance; has a signed compliance agreement; has received a consent order; has not met requirements based on applicable federal or state laws, regulations, standards, presidential Executive Orders (EOs), or DoD policies; and/or are immediate and essential to maintain operational integrity or sustain readiness of the military mission.

Class II: Maintenance Requirements. Includes projects and activities not currently out of compliance but which will be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year.

Class III: Enhancement Actions Beyond Compliance. Includes those projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or EO and are not of an immediate nature.

An additional assessment level is assigned to projects to assist in recognizing appropriate funding sources in Environmental Program Requirements (EPR) exhibits. The following descriptions of Navy Assessment Levels are summarized from the *Navy Environmental Requirements Guidebook* (Chief of Naval Operations [CNO] 2003). Navy Level 1 requirements are those prescribed by state or federal laws, regulations, and EOs; Level 1 requirements include OMB/EPA Class 0, I, or II projects and ongoing efforts. Navy Level 2 requirements are derived from DoD or Navy

policy; Level 3 requirements are for pending regulation; Level 4 requirements meet future requirements; and Level 5 requirements are leadership initiatives.

1.5.2 Funding Sources

Operations and Maintenance, Navy (O&MN) environmental funds are the primary source of resources to support Navy Level 1 (OMB/EPA Classes 0, I, and II) actions, though these funds are generally not available for Navy Level 2 through Level 5 actions. In addition, only the initial procurement, construction, or modification of a facility or project is a valid use of O&MN funds. The subsequent operation and maintenance is considered a Real Property Maintenance funding requirement. When natural resources actions are required as part of a military construction (MILCON) project, costs should be paid by MILCON funds as part of the overall construction project.

Forestry revenues from the sale of forest products on Navy lands are a source of funding for two different funding programs: Annual Navy Forest Funds and DoD Forestry Reserve Account. The DoD Forestry Reserve Account funds can be used for improvement of forestlands and for implementation of projects described in an approved management plan that provides for habitat improvement and protection. These funds are suitable for many of the types of natural resources management projects identified in the INRMP. User fees collected from the base fishing program may be used only for the protection, conservation, and management of fish and wildlife such as habitat improvement and related activities. National Public Lands Day funds are available for projects that showcase public lands and the importance of protecting natural resources through volunteerism. The National Environmental Education and Training Foundation manages and coordinates this fund. The Legacy Resources Management Program (Legacy) can provide funding for a variety of conservation projects such as habitat preservation efforts and ecosystem management efforts. A project proposal must be submitted in order to be eligible for Legacy funds.

1.5.3 Project Implementation Schedule

For prioritization and budgeting purposes, actions or projects recommended in the INRMP that require a request for funds are listed in a project summary table in Appendix B. The prime legal drivers, programming and budgeting priority, cost estimate, potential funding source, and completion schedule are identified for each project. Cost estimates may represent annual expenditures for natural resources staff and other technical support for planning, coordinating, and implementing activities or the cost of materials, personnel, and/or contractors associated with a project. All projects submitted for O&MN funding must be included in this INRMP or a clear justification for their omission must be provided. An INRMP increment addendum must be prepared annually to facilitate implementation of the INRMP. The annual increment addendum should provide concise detail and cost estimates of proposed work or projects planned for each fiscal year.

Relevant legal drivers and initiatives that were identified for each management issue in this INRMP are also summarized in the project implementation table. Primary statutes and regulations identified in the project table include the CWA, SAIA, ESA, NEPA, and Migratory

Bird Treaty Act (MBTA); state conservation laws; DoN and DoD instructions and policies; and presidential EOs.

All projects would undergo constant review and prioritization, and would be subject to budget constraints due to the cost of war or other mission related funding cuts. Projects would be assessed on an individual basis for compliance with the NEPA and other compliance related environmental requirements.

1.6 Scope of the Environmental Assessment

This EA has been prepared to evaluate the potential environmental impacts of implementing the proposed INRMP for NWS Yorktown. The analysis compares and summarizes the environmental consequences of the proposed action and alternative management objectives rather than individual projects or practices and is therefore a programmatic EA. Site-specific environmental analyses that are required for future projects may be tiered to this EA provided the anticipated impacts of a specific project, project components, the affected resources, or circumstances do not differ substantially from those evaluated in this EA.

Relevant resources evaluated in this EA include land use, soil resources; water resources; coastal zone resources; vegetation; wildlife; rare, threatened and endangered species; cultural resources; air quality; and socioeconomics and environmental justice. In compliance with NEPA and OPNAVINST 5090.1B guidelines, the scope of this EA focuses on those resources potentially subject to impact. Implementation of any of the alternatives would not be likely to affect noise, which was therefore not considered relevant to this assessment. Noise generated from implementation of any of the alternatives would not be above background levels and was therefore not considered relevant to this assessment.

2.0 PROPOSED ACTION AND ALTERNATIVES

This section of the EA describes and compares the proposed action, a no action alternative, and alternatives that were considered but not evaluated further.

- Alternative 1, No Action Alternative. Under this alternative, NWS Yorktown would continue implementation of the objectives and practices outlined in two separately bound natural resources management plans for WPNSTA (U.S. Navy 1996) and CAX/YFT (U.S. Navy 1999b).

- Alternative 2, Proposed Action. The proposed action is to develop and implement an INRMP consistent with the military use of the property and the goals and objectives established in the SAIA. The INRMP would include both compliance and stewardship actions and practices that meet the goals and objectives established in the SAIA.

- Alternative 3, Maximum Timber Production Alternative. This alternative would focus on maximizing the sustained yield of timber products while minimizing other natural resources program areas such as stewardship activities and outdoor recreation opportunities.

- Alternative 4, Preservation Alternative. This alternative would implement a natural resources program for preservation of land resources that precludes multiple uses of forests, fish and wildlife, land resources, and outdoor recreation.

2.1 Mission Constraints on Natural Resources Management

The major impacts to natural resources at WPNSTA and CAX have resulted from operational activities and past waste disposal practices. Numerous sites containing debris, explosives residue, and other materials have been identified. The Navy's Installation Restoration Program (IRP) is conducting Restoration and mitigation of contaminated soil, groundwater, and surface water resources. The potential for oil and hazardous materials spills also exists, but, as these materials are not transferred or stored in great quantities, environmental risks are considered minimal. At YFT, however, where storing and issuing fuels is the primary mission, fuel spills are the greatest potential impact to natural resources. Other impacts to natural resources include habitat loss and degradation of wetlands and water quality, which may occur as a result of construction of new buildings, magazines, roads, and other infrastructure.

At WPNSTA, virtually all of the natural resources are located within the confines of explosives safety quantity distance (ESQD) arcs, and much occurs within restricted areas. Security requirements necessitate restriction or severe limitation of access to these resources. These requirements primarily affect the management of natural resources for outdoor recreation. Mission activities essentially determine who can participate in certain outdoor recreation activities, as well as when and where those activities can take place.

2.2 Selection Criteria for Alternatives

Each alternative presented for analysis must be a reasonable alternative that meets the needs and purpose of the proposed action. Each alternative must integrate natural resources management at NWS Yorktown with the Station's military mission in a manner that ensures military preparedness and meets the requirements of SAIA and other conservation laws that regulate natural resources on federal lands. In order for an alternative to be viable it must maintain compliance with and follow guidance set forth by 32 CFR Part 190, DoD INST 4715.3, OPNAVINST 5090.1B CH3, and the Sikes Act (16 USC §670a-f). Specifically, each alternative must:

- Provide for sustainable multipurpose uses of natural resources;
- Maintain compliance with relevant environmental regulations;
- Provide for public access for use of natural resources subject to safety and military security considerations;
- Establish specific natural resources management objectives and time frames for proposed actions; and
- Prevent loss in the capability of military lands to support the military mission of the installation.

2.3 Alternatives Eliminated from Consideration

Alternatives to the proposed action that would disproportionately administer one portion of the natural resources program, such as forest or wildlife management, over others were considered and eliminated from further consideration. Alternative 3, the implementation of a natural resources program that maximizes the sustained yield of timber products while minimizing stewardship activities and outdoor recreation opportunities was eliminated from further consideration. Alternative 4, the implementation of a natural resources program for preservation of land resources and precludes multiple uses of forests, fish and wildlife, land resources, and outdoor recreation was also eliminated from further consideration. These alternatives would not constitute an integrated conservation program and would therefore not be compliant with SAIA, DoDI 4715.3, or OPNAVINST 5090.1B CH3, and would not adequately address other conservation compliance issues.

2.4 Alternatives Considered

Various natural resources management issues and program areas that are relevant to the natural resources program are addressed to various degrees by each of the alternatives considered. Important natural resources management issues include wetlands protection and mitigation, water quality protection, habitat restoration, grounds maintenance, forest management, fish and wildlife management, outdoor recreation, environmental awareness and community outreach, threatened and endangered species management, and pest management. Under Alternative 1,

these issues are grouped into three program areas: land management, fish and wildlife management, and forest management as they were addressed in the previous management plans. In Alternative 2, they are discussed as separate management issues. A brief description of the management objectives and ongoing and new initiatives for each alternative is presented below.

2.4.1 Alternative 1 – No Action

The no action alternative is the continued implementation of the management objectives and practices specified in the natural resources plans for WPNSTA (U.S. Navy 1996) and CAX/YFT (U.S. Navy 1999b). The existing management plans provide valuable information on natural resources management; however, the plans do not set time frames for implementation of or provide cost estimates for natural resources projects. Also, many of the project management recommendations provided in the current natural resources plans have been completed, and new projects described in the proposed INRMP would not be implemented under this alternative. In addition, no EA was completed for development of the existing plans, nor were they provided for public review. Consequently, the existing plans do not meet the SAIA requirements for an INRMP. The no action alternative is carried forward as a baseline for comparison to the proposed action as required by CEQ regulations. Natural resources management issues are addressed under three general program areas: land management, fish and wildlife management, and forest management in the existing INRMPs for WPNSTA, CAX, and YFT. A summary of each program area and recommended actions identified in the various sections of the existing management plans follows.

Land Management. The objectives of the land management section are to (1) manage all lands, wetlands, and water resources in accordance with proven scientific methods, procedures, and techniques to facilitate military missions and operations; and (2) implement land management practices that reduce grounds maintenance costs, conserve natural resources, improve real estate value, abate pollution, and control noxious weeds. Recommendations are to reduce grounds maintenance costs by reducing mowing and using regionally native plants in landscaping; obtain or develop digital wetlands, soils, and Chesapeake Bay protection area maps; assess pollution problems in several of the Station ponds; and identify existing erosion problems at the Station. Conducting a base-wide wetlands delineation and constructing a series of offshore breakwaters and shoreline armament to prevent bank erosion on four sites were recommended actions at CAX. Reducing mowing was the primary land management recommendation at YFT.

Fish and Wildlife Management. The objectives for the fish and wildlife management section are to (1) manage game fish and wildlife species and their habitats, to the maximum extent practicable, for optimum sustained yield; (2) conserve and promote conservation of nongame fish and wildlife and their habitats, to the maximum extent practicable, particularly habitats of state or federally listed rare, threatened, or endangered species; (3) increase the habitat carrying capacity for fish and wildlife; and (4) balance wildlife populations with the habitat carrying capacity. Management recommendations for game species were to continue participating in the Virginia Deer Management Program (DMAP) at WPNSTA and enroll in the program at CAX. Additional recommendations are to conduct annual deer population surveys, to collect and analyze annual turkey harvest data, and to conduct fish surveys at the Station ponds. Management recommendations for nongame species included developing partnerships for cooperative research and enhancing existing habitat for rare, threatened, and endangered species.

An additional management recommendation at CAX is to reduce populations of nuisance wildlife including Canada geese, brown-headed cowbirds, and beavers.

Forest Management. The objectives for the forest management section are to (1) adopt practices that emphasize conservation of biodiversity; (2) implement practices that provide for sustained multipurpose uses and appropriate public access; (3) integrate forest management practices with fish and wildlife management, land management, and outdoor recreation; (4) encourage practices that emphasize protection from wildfire, pest, and disease damage; (5) recover economic value from damaged or dying trees through maintenance of a firewood cutting program; and (6) recover economic value from timber cleared for construction projects through timber sale or firewood cutting fees. Management recommendations are to acquire digital ortho-rectified imagery of the Station and conduct a timber inventory based on the newly acquired imagery. Development of a new forest management plan is also recommended. Recommended silvicultural treatments are to thin or harvest dense and overmature pine stands and use prescribed burns for pine management.

Protection of threatened and endangered species is also identified as an objective in the forest management section of the existing INRMP. Recommendations for their protection include delineating areas where threatened and endangered species occur as special interest areas and integrating their protection in forest management and other Station activities.

Outdoor Recreation. The objectives for the outdoor recreation management section are to (1) emphasize outdoor recreation benefits within the constraints of the military mission and the capability of the resources; (2) protect and preserve natural and other special interest areas wherever feasible; (3) mediate conflicts between competing recreational uses; (4) ensure multiple use of natural resources for outdoor recreation and other purposes on a sustained yield basis; and (5) maximize outdoor recreational opportunities for the benefit of military personnel and their dependents. Management recommendations are to develop a hunting program brochure with maps of the Station's hunting departments; for the natural resources staff to oversee hunting stand location and maintenance; and for the Station game wardens to attend annual wildlife law enforcement courses. At CAX, improving recreational fisheries by stocking game and forage fish in several of the Station's ponds is recommended.

Oil Spill Response Guidelines and Natural Resources Damage Assessment. The objectives for this management section are provided in the CAX/YFT natural resources plan. The probability of fuel spills is a significant management issue and concern for the environment because of the storage and transfer of large volumes of fuel for military operations. The Virginia Coastal Area Contingency Plan and Contact Matrix, available from the U.S. Coast Guard Marine Safety Office, provides recommendations and information in the event of a fuel/oil spill. A multi-agency Cleanup Assessment Team under the direction of a Federal On-Scene Coordinator conducts natural resources damage assessments from a fuel/oil spill.

2.4.2 Alternative 2 – Proposed action

The proposed action is to implement an INRMP that addresses natural resources management of NWSTA, CAX, and YFT into a single comprehensive document and is consistent with the military use of the property and the goals and objectives established in the SAIA. The goal of

the INRMP is to implement an ecosystem-based natural resources program that provides for conservation of natural resources in a manner that is consistent with the military mission; integrates and coordinates all natural resources management activities; provides for sustainable multipurpose uses of natural resources; maintains compliance with relevant environmental regulations; and provides for public access for use of natural resources subject to safety and military security considerations. The plan discusses a number of management issues relevant to natural resources management and describes specific projects for each issue as appropriate. A summary of the plan's objectives and recommended actions and practices for each of these issues follows. A project summary table is in Appendix B.

Wetlands/Water Quality Protection. Under the proposed action, wetlands and water quality would continue to be managed in accordance to relevant state, federal, and local water protection laws and EOs on wetlands and floodplain protection. Recent regulatory changes and installation responsibilities are described in the proposed INRMP. Updated wetlands information, including new wetlands maps that were created during preparation of the proposed INRMP, would be made available for land use planning under the proposed action. Ongoing plans to install bank stabilization structures at CAX would continue under this alternative, and additional actions would include planting and maintaining riparian forest buffers on two sites at WPNSTA.

Grounds Maintenance and Urban Forestry. The primary goals of grounds maintenance under the proposed action would be to provide an attractive, well-maintained working and living environment for personnel and to protect the real estate value of the installations. The landscaped trees, shrubs, and wooded areas comprise the urban forest. Care and maintenance of the urban forest is particularly important for the safety of personnel and their dependents and the protection of real estate. Under the proposed action, natural resources staff would continue to promote the use of beneficial landscaping practices as described in the proposed INRMP, oversee grounds maintenance contracts including tree pruning and removal, and provide tree care instruction to the Station's First Lieutenant's Division. An urban forest management plan would also be developed under the proposed action.

Forest Management. Long-term forest management objectives of the proposed INRMP are to (1) maintain the health and integrity of forested buffers around all munitions magazines and munitions handling facilities in accordance with mission safety requirements; (2) maintain a diversity of healthy and productive natural forested ecosystems; (3) conserve and enhance biodiversity; (4) provide for sustained multipurpose uses and provide public access appropriate for those areas to the extent that those uses are consistent with the mission and ecosystem management; (5) protect unique and sensitive natural areas and habitat that are critical to rare, threatened, and endangered species; and (6) use best management practices (BMPs) to protect soil and water resources. Continued actions would include thinning or harvesting, replacing overstocked and overmature pine stands, conducting forest health monitoring, and conducting prescribed burns to reduce the risk of catastrophic wildfire. New management activities would include assessing forest stands for thinning and harvest needs and updating forest stand prescriptions based on the new stand assessments.

Fish and Wildlife Management. Under the proposed action, an important function of the natural resources program would be to continue to maintain and enhance habitats to support a full spectrum of native wildlife species, including fish, birds, mammals, herpetofauna, and

invertebrates. The basic objectives of fish and wildlife management would be to (1) manage fish and wildlife species and their habitats within the constraints of the military mission; (2) conserve and promote conservation of game and nongame fish and wildlife and their habitats, particularly habitats of state- or federal-listed rare, threatened, or endangered species; (3) balance wildlife population levels with habitat carrying capacity; and (4) provide recreational opportunities for installation personnel and their dependents and community members. Periodic fisheries surveys of the Station's recreational fishing ponds would continue under Alternative 2, and recommendations for pond improvements, such as replacing water control structures, would be implemented. Both WPNSTA and CAX would continue to be enrolled in DMAP and continue to collect annual deer harvest data.

Outdoor Recreation and Environmental Awareness. The primary objectives of outdoor recreation and environmental awareness initiatives under the proposed alternative would be to (1) improve the quality of life for installation personnel, their dependents, and the military community by providing for outdoor recreation opportunities to the maximum extent possible within the constraints of the military mission and capability of the natural resources; and (2) foster understanding and awareness of the environment through educational programs. Natural resources staff would continue to have oversight of the placement of hunt stands and the construction of new stands over the next few years. New projects implemented under the proposed action are installation of gates on dirt roads and trails to prevent trespassing on National Park Service (NPS) land and prevent disturbance by unauthorized vehicular use and construction of a handicapped-accessible fishing pier on Penniman Lake.

Threatened and Endangered Species Protection. The primary factor in threatened and endangered species protection that would be implemented under Alternative 2 would be the protection of significant habitat that is important to the continued survival and expansion of threatened and endangered species populations. The proposed INRMP would present updated location maps for all known rare, threatened, and endangered species and significant natural habitats as delineated by the Virginia Department of Conservation and Recreation-Division of Natural Heritage (VDCR-DNH) and VDGIF in 2003. These maps would assist all natural resources and land use planning activities avoid disturbance to these important natural resources.

Habitat Conservation and Restoration. Habitat conservation and restoration are important natural resources management issues in the proposed INRMP. Management activities that would be accomplished under the proposed INRMP include maintenance of 18 IRP sites and habitat restoration on seven sites where buildings or other infrastructure have been demolished. Updated maps of special interest areas recommended for protection by the VDCR-DNH would also be made available for planning under the proposed action.

Pest Management. Under the proposed action, the goals of pest management would be to prevent or control pests and disease vectors that may adversely affect military readiness or operations by affecting the health of personnel or damaging structures, material, or property. Pest management practices would emphasize integrated pest management practices and would be conducted in accordance with the existing Station pest management plan until the new regional plan is finalized. Invasive species and nuisance wildlife control would be the main pest management activities under the proposed INRMP.

Cultural Resources Management. Under the proposed action, maps and information on the status and location of historic and archeological resources derived from the Integrated Cultural Resources Management Plan and additional survey work (U.S. Navy 2002b) for WPNSTA (U.S. Navy 1999a) and Historic and Archaeological Resources Protection Plan (U.S. Navy 1997) for CAX and YFT would be made available to natural resources and other Station activities. Maps and information on the status of known cultural resources and survey locations would help natural resources managers and Station planners comply with cultural resources protection regulations.

3.0 AFFECTED ENVIRONMENT

This section describes the relevant existing environmental conditions that would be impacted by implementation of the alternatives discussed in Section 2.0. In accordance with CEQ regulations (§ 1502.15), the descriptions presented below are no longer than necessary to understand the potential effects of implementation of the proposed action or alternatives. More detailed information on the affected environment is presented in the INRMP that accompanies this EA.

3.1 Land Use

3.1.1 Regional Land Use

NWS Yorktown is part of a large area of publicly owned land on the peninsula that includes CNHP, Camp Peary Naval Reservation, the U.S. Coast Guard Reserve Training Center, Newport News Park and watershed protection areas, and various York County parks. Because of the area's historical significance, tourism and recreation are important land uses in York and James City counties. Other land uses in the ROI are residential, commercial, and industrial.

3.1.2 Station Land Use

WPNSTA may be generally divided into two land management areas: the restricted areas (9,790 acres) and the administrative and housing areas (518 acres). The restricted area includes the Station's ordnance storage, handling, and disposal facilities. The area consists of undeveloped forestland, marsh, and open water; magazine complexes; wildlife food plots; road shoulders; and other maintained open areas. The administrative and housing areas encompass the more densely developed portions of WPNSTA, including administrative buildings, facilities maintenance structures, Station housing, storage and warehouse facilities, and concentrated recreation areas (ball fields, horse stables, and golf course).

CAX may be generally divided into three separate land management areas: the undeveloped portion of the main base (439 acres), the administrative and operational areas (667 acres), and the Jones Pond tract (406 acres). The undeveloped area is largely forested and provides mission support by creating noise buffers, safety zones, and opportunities for outdoor recreation for Station personnel and their dependents. The administrative and operational areas are predominantly developed in facilities support buildings, although significant patches of forest and concentrated recreational areas (golf course, ball fields, and camping areas) are also included. The Jones Pond tract includes the 45-acre Jones Pond Reservoir and the surrounding forested area. Most of the unit is comprised of steep slopes on deeply cut ravines with soils that have a moderate to severe erosion hazard.

The entire area at YFT (138 acres) is dedicated to receive, store, and issue jet petroleum fuel to Defense Logistics Agency customers including Fort Eustis, Virginia, and Langley Air Force Base, Virginia. A large portion of the terminal is undergoing installation restoration of its underground fuel tanks.

3.2 Soil Resources

Twenty-four soil types occur at WPNSTA and 16 occur at CAX. Of these, 13 soil types may be considered major soil associations or complexes. Soils throughout the installations largely consist of sandy loam, silty loam, and loam surface soils. The soils generally range from strongly acid to extremely acid, though some neutral to alkaline soils also occur. Inherent fertility is generally low though a few soils have medium to high fertility. Four major soils and two minor soils are listed as hydric by the Natural Resources Conservation Service [NRCS] 1993). The remaining soils are upland soils that are well drained to moderately well drained.

Soil survey data specific to YFT are not available; however, Udorthants (disturbed by excavation and grading topsoil removal) are likely to be the dominant soil type because of the extensive disturbed area on the property.

3.3 Water Resources

WPNSTA lies within the boundaries of two major watersheds: the York River basin (75 percent) to the north and the James River basin (25 percent) to the south. CAX and YFT are located entirely within the York River basin. Over 95 percent of the WPNSTA's facilities are located outside the 100-year floodplain. Other than the shoreline of King Creek and Penniman Lake at CAX, very little land area at CAX or YFT is within the 100-year floodplain.

3.3.1 Groundwater

WPNSTA/CAX is in the Northern Atlantic Coastal Plain aquifer system, which extends from Long Island to the southern edge of North Carolina (U.S. Geological Survey [USGS] 2001). On the peninsula, groundwater occurs in three major shallow aquifers: the Columbia Aquifer, Cornwallis Cave Aquifer, and Yorktown-Eastover Aquifer (Nelms et al. 2001). The Yorktown-Eastover Aquifer is the major aquifer at WPNSTA/CAX, and though not used as drinking water at the Station, it does supply potable water to parts of the surrounding community.

3.3.2 Surface Water

Surface waters of WPNSTA include four major, tidally influenced tributaries to the York River, numerous small creeks, and six freshwater impoundments that were formed by damming or constricting outflows of natural drainage features. Surface waters at CAX consist of five artificial impoundments (nontidal and freshwater) formed by damming portions of natural drainages. Jones Pond and Penniman Lake are each 45 acres, Cheatham Pond is 108 acres, Walt Feurer Youth Pond is 2 acres, and Catfish Pond is 1 acre. Surface waters at YFT include the West Branch of Wormley Creek and a small freshwater impoundment.

3.3.3 Wetlands

Wetlands maps were created in the mid-1990s for WPNSTA/CAX under a Memorandum of Understanding (MOU) between the USFWS National Wetlands Inventory and the Department of the Navy. In 2002, Geo-Marine, Inc. (GMI) updated the inventory using color infrared

orthophotography and ArcView geographic information system mapping. A total of 868 acres were mapped as wetlands at WPNSTA, 140 acres at CAX, and 22 acres at YFT. Wetlands were classified according to the Cowardin et al. (1979) classification of wetlands and deepwater habitats. Estuarine wetlands include King Creek, Felgates Creek, Indian Field Creek, and areas along the York River at WPNSTA; areas abutting Queen Creek, King Creek, and York River at CAX; and the West Branch of Wormley Creek at YFT. Riverine wetlands included intermittent and perennial streams. Lacustrine wetlands include the major ponds and lake. Palustrine wetlands include the Station's smaller ponds and nontidal vegetated wetlands that are less than 20 acres or 6.6 feet deep.

3.4 Virginia Coastal Zone Resources

The Federal CZMA of 1972 provides a procedure for the states to review federal actions for consistency with their own approved coastal management program. The CZMA encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife supported by those habitats. Virginia's coastal management area includes the entire Tidewater region. Although federal lands are excluded from state coastal management areas, activities on federal lands that are reasonably likely to affect use of lands or waters, or natural resources of Virginia's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Resources Management Program (CRMP).

The Virginia CRMP establishes policies and objectives to guide the use and development of coastal management areas to ensure their protection and preservation. Included are policies on 1) fisheries management, 2) subaqueous lands management, 3) wetlands, 4) primary dunes, 5) point source water pollution, 6) non-point source water pollution, 7) point and non-point source air pollution, 8) shoreline sanitation, and 9) coastal lands management.

3.5 Vegetation

In Virginia, ecological communities are classified and ranked using a natural community classification system developed by VDCR-DNH (Fleming et al. 2001). A brief description of the ecological communities is given below. Detailed species lists and community descriptions are included in the INRMP that accompanies this EA.

Basic mesic forests are mixed hardwood forests that typically occur on sheltered north- to east-facing slopes and steep ravines that have eroded down to fossilized shell deposits of the Yorktown Formation. Coastal Plain basic seepage swamps are deciduous forested wetlands that occur in small, saturated stream bottoms in ravines that have downcut into Tertiary shell deposits or sands formed from crushed shell. Coastal Plain depression ponds are seasonally flooded basin wetlands of flat uplands with fluctuating, seasonally perched water tables.

Coastal plain dry calcareous forests (canopy cover typically greater than 60 percent) and Woodlands (canopy cover typically 5 to 60 percent) are rare and localized communities of deciduous or occasionally mixed forests and woodlands. Mesic mixed hardwood forests occur

on level ridgetops, mesic uplands, and lower slopes on acidic, relatively poor soils. This forest type is commonly referred to as southern mixed hardwood forest. Mixed Oak/Heath Forests are oak (*Quercus* spp.) dominated forests with blueberry (*Vaccinium* spp.), huckleberry (*Gaylussacia* spp.), or other understory species on upland sites.

The Coastal Plain/Piedmont bottomland forest includes a diverse group of temporarily and seasonally flooded forests. Coastal Plain/Piedmont seepage swamps are saturated deciduous or mixed forested wetlands that occur at the stream bottom of small headwaters and toe slopes with abundant groundwater seepage. Coastal Plain semipermanent impoundments encompass areas of aquatic and shoreline vegetation of both beaver ponds and long-established man made ponds along streams. This community type is equivalent to nontidal palustrine emergent wetlands in the Cowardin et al. (1979) classification system.

Tidal freshwater marshes are regularly flooded marshes that lie along the upper reaches of rivers and their tributaries. Freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal waters has less influence than freshwater from upstream. This community includes the tidally influenced palustrine wetlands. Lower, more regularly flooded tidal areas with high salt concentrations occur in narrow fringes along tidal rivers and are characterized by very low species diversity and small plant stature. All of the estuarine marshes at WPNSTA/CAX are included in these communities.

Tidally flooded shrub swamps of freshwater to brackish rivers and embayments frequently occur in fringes between emergent tidal wetlands and swamp forests or uplands. The flora is very diverse and typically contains species characteristic of both tidal marshes and swamp forests. This community type includes the tidally influenced palustrine scrub-shrub wetlands.

Several vegetative cover types that occur at WPNSTA, CAX, and YFT are not included in the VDCR-DNH ecological community classifications. These include; naturally occurring and planted loblolly pine (*Pinus taeda*) stands, which occur on ridges and relatively level areas that were previously farmed; areas classified as maintained open areas that are infrequently mowed or otherwise maintained; urban vegetative communities such as frequently mowed areas with significant infrastructure (roads, railroad tracks, buildings, and magazines); and lawns, landscaped areas, street trees, ball fields, and other frequently mowed open areas that are also classified as urban vegetative communities.

3.6 Wildlife

Because of the diversity of habitats, a wide variety of wildlife species occurs at NWS Yorktown. Faunal surveys, including Buhlmann and Ludwig (1992), Buhlmann et al. (1990), GMI (2002), and, have identified a large number of mammals, reptiles and amphibians (herpetofauna), and birds. Species lists are included in the INRMP that accompanies this EA.

The most common large mammals known to occur include white-tailed deer (*Odocoileus virginianus*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes vulpes*). A variety of reptiles and amphibians is known to inhabit the area. The most common snakes include the northern watersnake (*Nerodia sipedon*) and black rat snake (*Elaphe obsoleta*). Common lizards include the ground skink (*Scincella lateralis*) and the five-lined skink (*Eumeces fasciatus*), and

common frogs and toads include the green frog (*Rana clamitans*), southern leopard frog (*Rana sphenocephala*), southern toad (*Bufo terrestris*), and American toad (*Bufo americanus*). Salamanders include the spotted salamander (*Ambystoma maculatum*), marbled salamander (*Ambystoma opacum*), and red-spotted newt (*Notophthalmus viridescens*).

Freshwater fish habitat is restricted to man-made lakes and ponds, and streams. No surveys of the streams have been conducted. The lakes and ponds support several species of fish that were either intentionally stocked or were released by fishermen. Stocked species include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and black crappie (*Pomoxis nigromaculatus*). Other species collected during fisheries surveys (Galvez and Swihart 1999; Swihart and Daniel 1994; USFWS 2002) include golden shiner (*Notemigonus crysoleucas*), American eel (*Anguilla rostrata*), mudminnow (*Umbra limi*), and bluespotted sunfish (*Enneacanthus gloriosus*).

Bird species include a mix of species that utilize forests, forest edges, open fields, urban areas, and wetlands. Nearly 100 species were recorded during surveys at WPNSTA Buhlmann and Ludwig (1992), GMI (2002), and almost 300 bird species have been recorded on CAX by the Williamsburg Bird Club (U.S. Navy 1999b). Bird common names are standardized by the American Ornithologist's Union and when capitalized are frequently used in lieu of scientific names. Forest-dwelling birds include the Brown Thrasher, Red-Eyed Vireo, Red-Shouldered Hawk, and Barred Owl. Common birds that use open habitats are the Eastern Bluebird, Northern Mockingbird, American Robin, and Brown-Headed Cowbird. Wetlands and open water habitats attract a variety of wading birds and waterfowl, including Great Blue and Green-Backed herons, Great Egrets, and Canada Geese. Common bird species such as House Sparrows, House Finches, and Rock Doves (Pigeons) occur in urban settings.

3.7 Rare, Threatened, and Endangered Species

Inventories of rare, threatened, and endangered species and significant natural communities have been conducted at WPNSTA/CAX (Buhlmann and Ludwig 1992; Buhlmann et al. 1990; Van Alstine et al. 2003). To date, inventories have documented one federally listed (threatened) species, bald eagle (*Haliaeetus leucophalus*); one state-listed (endangered) species, Mabee's salamander (*Ambystoma mabeei)*; and one rare moth (*Sphinx franckii*). At CAX two rare plants, bog twayblade (*Liparis loeselii*) and southern beach spurge (*Chamaesyce bombensis*) have been documented. No threatened, endangered, or rare species are known to occur at YFT.

3.8 Cultural Resources

An Integrated Cultural Resources Management Plan (ICRMP) has been developed for WPNSTA (U.S. Navy 1999a). A Historic and Archaeological Resources Protection Plan (HARPP) was developed for CAX (U.S. Navy 1997). These documents have detailed maps of known site locations for use as a planning tool.

In 2001, a 6,000-acre survey was completed at WPNSTA (U.S. Navy 2002b). As a result, a total of 8,515 acres of the Station has been archeologically surveyed. A total of 366 archeological sites (both historic and prehistoric) has been recorded on the installation dating from the Paleo-

Indian through late Historic periods. The 2001 survey identified 246 of the 366 sites known at WPNSTA. Of the 120 sites recorded prior to the 2001 survey, one is currently listed on the National Register of Historic Places (NRHP), five have been determined eligible for listing, and 49 are potentially eligible (U.S. Navy 1999a). The listed site and the five sites determined eligible for listing are all historic domestic sites. The 49 sites considered potentially eligible contain 26 prehistoric components and 39 historic components. Seventy-two of the 246 sites recorded in the 2001 survey contain components potentially eligible for the NRHP, including 32 Native American and 48 historic period components.

All of the structures at WPNSTA have been surveyed for their historic significance, including possible Cold War-era significance. Two resources have been identified at the Station: Kiskiack and the Mason's Row Historic District. Kiskiack, the oldest building owned by the Navy, was built at the beginning of the eighteenth century. Because of its rarity, Kiskiack is categorized at the highest level of significance for protection and preservation and was listed on the NRHP in 1969. Mason's Row Historic District consists of nine whitewashed brick officer's quarters constructed between 1920 and 1941 that form an architecturally cohesive grouping. The district has been nominated for the State Register of Historic Places because of its representation of the Colonial Revival architectural style. These buildings have been given an average rating in regards to protection and preservation by the Navy (U.S. Navy 1999c).

The HARPP documents 18 potentially eligible archeological sites including six historic period, five Native American, and six multicomponent sites recorded at CAX. Each of these sites requires further evaluation before a determination of eligibility for listing in the NRHP can be made. The HARPP indicates that all 319 structures located at CAX have been determined not eligible for inclusion in the NRHP and that no properties constructed since 1950 were found to possess the exceptional significance in the Cold War era necessary for inclusion in the NRHP (U.S. Navy 1997). The HARPP also indicates those portions of CAX determined to be clear of significant cultural resources for planning purposes.

3.9 Air Quality

The NAAQS have been established by the EPA for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). In addition, the CAA of 1970 requires that states with designated ozone nonattainment areas regulate volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) because they are precursor pollutants to ozone formation.

NWS Yorktown is in EPA Region 3, Hampton Roads Air Quality Control Region. The area was designated as being nonattainment for ozone (marginal) between 1993 and 1997; however, in 1997 the area was redesignated as an attainment area for ozone and is currently designated as a maintenance area for ozone and is located outside an ozone transport region (EPA 2003). Section 107(d)(3)(E) of the 1990 Clean Air Act Amendments (CAAA) states that the following criteria must be met in order for an area to be redesignated from nonattainment to attainment:

- The EPA has determined that the NAAQS has been attained. This standard is 0.12 parts per million (ppm) for ozone.
- The applicable State Implementation Plan (SIP) has been fully approved by the EPA under Section 110(k).
- The EPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions.
- The state has met all applicable requirements for the area under Section 110 and Part D.
- The EPA has fully approved a maintenance plan, including a contingency plan, for the area under Section 175A.

The CAAA state that federal agencies cannot support any action that does not conform to an EPA-approved SIP. A General Conformity Rule applicability analysis is required to demonstrate that the proposed federal action conforms to the SIP. Ongoing actions and actions that are identified in the SIP are exempt from demonstrating conformity. Other actions are assumed to be in conformity if total project emissions are below a minimum threshold level (*de minimis* level) and less than 10 percent of the regional emission inventory. Projects below the *de minimis* level are not subject to the General Conformity Rule; those projects at or above the levels are required to perform a conformity analysis. *De minimis* emissions levels for areas of ozone maintenance areas are presented in Table 3-1.

Table 3-1. *De Minimis* Exemption Levels in Maintenance Areas.

Pollutant/Maintenance Classification	Emissions (tons/year)
Ozone (NO_x)	
All maintenance areas	100
Ozone (VOCs)	
Maintenance areas outside an ozone transport region	100

Source: 40 CFR § 93.153(b)(2)

3.10 Socioeconomics and Environmental Justice

Socioeconomic analyses generally provide a detailed investigation of the prevailing population, income, employment, and housing conditions of a community or area of interest. This section provides a description of these demographics within the ROI, which includes York and James City counties and the City of Newport News.

Environmental justice is another important aspect of a socioeconomic analysis. EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that each federal agency ensure that achieving environmental justice is part of its mission by identifying and addressing, as appropriate, disproportionately high human health or environmental effects of its programs, policies, and activities on minority populations

and low-income populations. Each year the U.S. Census Bureau (USCB) defines the national poverty thresholds, which are measured in terms of household income dependent upon the number of persons within the household. In 2000, the average threshold was $17,603 for a family of four and $13,738 for a family of three (USCB 2001).

3.10.1 Demographics

In 2000, the population within the ROI was 284,549 persons, an increase of 15.1 percent over the 1990 population of 247,326 (USCB 1993, 2003). In 2000, the demographic profile of the ROI was 48.1 percent White, 29.4 percent Black or African American, 0.3 percent American Indian or Alaska Native, 2.4 percent Asian, 0.1 percent Native Hawaiian, 2.1 percent all other races or combination of races, and 3.4 percent Hispanic (USCB 2003). The total minority population within the ROI was 147,545, approximately 51.9 percent of the total population (USCB 2003).

3.10.2 Income and Employment

Total full-time and part-time employment within the ROI increased by 13.5 percent to 193,230 jobs between 1990 and 2000 (Bureau of Economic Analysis [BEA] 2003a). York and Poquoson experienced an increase of 37.2 percent; James City and Williamsburg experienced an increase of 31.7 percent; and Newport News increased by 2.7 percent (BEA 2003a).

Total personal income increased 73.6 percent between 1990 and 2000 to $8.7 billion. James City and Williamsburg experienced the largest percent increase in personal income between 1990 and 2000, 140.7 percent to $2.4 billion (BEA 2003b). Total earnings increased 79.3 percent between 1990 and 2000 to $6.3 billion (BEA 2003b). James City and Williamsburg had the highest increase in earnings between 1990 and 2000 at 77.4 percent to $1.4 billion (BEA 2003b).

The median household income in 2000 ranged from a high of $57,956 in York County to a low of $36,597 in Newport News (USCB 2003). Per capita personal income ranged from a high of $29,256 in James City to a low of $17,843 in Newport News (USCB 2003). The poverty status in 2000 varied from a low of 3.5 percent in York County to a high of 13.8 percent in Newport News (USCB 2003). Poverty rates within all three regions of the ROI fell at least one percentage point between 1990 and 2000.

4.0 ENVIRONMENTAL CONSEQUENCES

This section presents an analysis of the potential environmental consequences of the two alternatives described in Section 2.0. The potential impacts to the human and natural environment are evaluated relative to the existing environment described in Section 3.0. The overall management approach and management practices are evaluated on a programmatic level, rather than a project-specific level. The intent is to evaluate the overall impacts of implementing the alternatives in a broad sense. Such a programmatic analysis provides opportunities for the installation to accommodate unforeseen projects, as well as changes to projects, as long as impacts are covered within the overall scope and analysis of this EA.

Land use would be impacted if natural resources management activities caused inconsistencies that reduced the viability of existing land use activities; created threats to public health, safety, and welfare of adjacent or nearby land users; or conflicted with the military mission. Soils would be impacted if current or proposed activities resulted in severe soil loss such that the areas could no longer maintain the existing land use or caused sedimentation in adjacent water bodies. Impacts to biological resources would be significant if species or habitats of concern are adversely affected over relatively large areas or disturbances cause reductions in population size or distribution of a species of concern. Water resources would be impacted if activities resulted in a change to the groundwater or surface water quantity or quality and wetlands. Potential impacts to cultural resources could occur if natural resources management activities resulted in disturbance to significant historic structures or archeological deposits. Air quality would be impacted if activities resulted in an exceedance of the National Ambient Air Quality Standards (NAAQS), exceedance of *de minimis* exemption levels, or the exposure of sensitive receptors to increased pollutant concentrations. Socioeconomic resources would be impacted if activities resulted in a change to the population, employment, or income potential of NWS Yorktown and the region of influence (ROI). Environmental justice impacts would be considered if minority and/or low-income populations within or adjacent to NWS Yorktown would experience disproportionate adverse effects from implementing the current or proposed natural resources management activities.

The natural resources management activities evaluated were designed to avoid negative environmental impacts and include planning measures for compliance with applicable laws and regulations. Therefore, none of the activities currently being conducted nor any of the project actions recommended in the proposed action would have the potential to cause significant negative environmental impacts. The proposed action (Alternative 2) would provide greater environmental benefits than either continuing the no action alternative (Alternative 1) because the fullest range of management projects would be implemented to ensure an ecosystem approach to natural resources management is achieved. Implementation of the proposed action would help ensure ecosystem function and integrity are preserved and human social and economic interests are considered and integrated with environmental considerations. The environmental consequences of each alternative are summarized in Table 4-1.

Table 4-1. Comparison of Alternatives.

Resource	Alternative 1 No Action	Alternative 2 Proposed Action
Land Use	No change	Positive effects on the Station's ability to sustain military land use
Soil Resources	No change	Positive effects from review of soil erosion and control plans and recommended project implementation
Water Resources	No change	Positive effects from project implementation that protects, conserves, and enhances water resources
Coastal Zone Resources	No change	Positive effects from enhancing riparian forest buffers and installing shoreline protection measures
Vegetation	No change	Positive effects from forest management activities and invasive species control
Wildlife	No change	Positive effects from game and nongame management, habitat enhancements, deer population control, pond improvements, and integration of overall ecosystem management
Threatened and Endangered Species	No change	Positive effects from rare species surveys and protecting and enhancing rare species habitat
Cultural Resources	No change	Positive effects from integration with the cultural resources management plans
Air Quality	No change	Minimal effect from emissions; action is in conformity with State Implementation Plan
Socioeconomics	No change to population, income, or employment	No change to population, income, or employment
Environmental Justice	No disproportionately high adverse impact on minority or low-income populations	No disproportionately high adverse impact on minority or low-income populations

4.1 Alternative 1 – No Action

Under the no action alternative, natural resources would continue to be managed in accordance with existing plans and programs. However, without implementation of the INRMP (Alternative 2), future actions and projects would not be planned and accounted for as required by SAIA. Baseline conditions of the affected environment would not change under the no action alternative, nor would the full benefits realized under the INRMP be achieved.

4.1.1 Land Use

Selecting the no action alternative would not adversely impact land use on NWS Yorktown since the continuation of the current natural resources programs would not reduce the capability of lands to support the military mission nor affect surrounding land use. Whereas mission activities

must consider potential impacts on natural resources as part of standard operating procedures, implementation of the natural resources program does not formally constrain mission activities or determine land use. Mission security and safety and/or regulatory requirements are primary considerations for imposing land use restrictions. Mission activities would continue to be supported in the restricted area by grounds maintenance and forest management activities.

4.1.2 Soil Resources

Under the no action alternative, positive effects from review of soil erosion and sediment control plans would continue as part of the current management activities. The baseline conditions for soil resources would continue at NWS Yorktown. Digital maps of base soils would be used for planning purposes to protect and manage soil resources. In addition, BMPs would continue to be used to minimize potential impacts from soil disturbance.

4.1.3 Water Resources

Implementation of the no action alternative would not result in adverse impacts and would create overall positive effects to water resources at NWS Yorktown. Management actions would continue to be conducted in accordance with state and federal regulations for water quality and wetlands protection. Review of permitting requirements for storm water management plans and compliance with wetlands regulations would continue under the current management program. Implementation of current natural resources management practices such as erosion and sediment control measures and forestry BMPs would continue to protect water resources.

4.1.4 Coastal Zone Resources

There would be no change to coastal zone resources under the no action alternative. All projects and actions would continue to be consistent to the maximum extent possible with the Virginia CRMP.

4.1.5 Vegetation Resources

Selecting the no action alternative would not result in adverse impacts to vegetation resources since current management practices would continue. Basic management such as grounds maintenance practices and forest management would continue to have positive effects on the existing vegetative communities under the no action alternative.

4.1.6 Wildlife Resources

Selecting the no action alternative would not result in adverse impacts to wildlife resources since current management practices would continue. Deer population management and integration of forest management would continue to have positive effects on wildlife populations and habitats under the no action alternative.

4.1.7 Threatened and Endangered Species

Under the no action alternative, there would be no effect to threatened and endangered species since current management practices would continue. The continued protection of rare species habitat would serve to protect threatened and endangered species.

4.1.8 Cultural Resources

Selecting the no action alternative would not change baseline conditions for cultural resources due to the continuation of current management practices. Protection and management of cultural resources under the no action alternative would continue as a compliance requirement in the natural resources program. Section 106 consultations would be conducted as necessary with the Virginia State Historic Preservation Officer (SHPO) prior to implementing any ground-disturbing activities.

4.1.9 Air Quality

Implementing the no action alternative would not change the local or regional air quality. There are no stationary pollution sources involved in the current natural resources management programs. Under the no action alternative, prescribed burning would be conducted as part of forest management and is the only activity with the potential to significantly affect local and regional air quality. However, prescribed burning would be conducted on a very limited basis (less than 100 acres per year). The potential emissions of criteria pollutants would be much less than the *de minimis* exemption levels for conformity determinations in maintenance areas. Under Alternative 1, NWS Yorktown would continue to coordinate with the WPNSTA/CAX Fire Department and the Regional Natural Resources Manager. Virginia Department of Forestry (VDOF) and the Chief Ranger at CNHP would also be notified prior to ignition of any prescribed fire.

4.1.10 Socioeconomics and Environmental Justice

Income generated from any commercial timber sales would be negligible compared to the local economy. Hunting, fishing, and other outdoor recreational opportunities, which would improve the quality of life for Station personnel, their dependents, and the surrounding community, would continue under this alternative. Nor would this alternative have a disproportionately high or adverse impact on minority or low-income populations or pose environmental health or safety risks that would disproportionately affect children (EO 12898, Federal Actions to Address Environmental Justice in Minority Population and Low Income Population, and EO 13045, Protection of Children from Environmental Health Risks and Safety Risks). Therefore, under the no action alternative, there would be no change in the potential effects of natural resources management on socioeconomics and environmental justice.

4.2 Alternative 2 – Proposed Action

Selecting the proposed action would implement a broad range of natural resources management activities and practices, which support Navy policy on good stewardship and ecosystem

management. Adaptive management would be used to assess and improve management practices and help ensure stated objectives are achieved. Baseline conditions would remain unchanged or improve under this alternative.

4.2.1 Land Use

Implementing the proposed action would not result in adverse impacts to land use or impact planned land use in the regional area. Implementation of the proposed action would not change the existing or future land use in terms of supporting the military mission. However, positive benefits to the installation's ability to sustain military land use by maintaining ecosystem integrity would be provided by protecting soil and water resources, improving aesthetics, and providing information for future land use management decisions. Delineation of wetlands and other natural resources management actions would provide basic information for planning purposes. Since the proposed INRMP was prepared through interagency coordination and stakeholder reviews of the major actions, the proposed action would be compatible with regional resource management initiatives.

4.2.2 Soil Resources

Implementation of the proposed action would not result in adverse impacts, but would create positive effects on soil resources through review of erosion and sediment control plans for construction projects and specifically planned project implementation. In addition to the soil resources protection measures described in Alternative 1, management practices would be implemented under Alternative 2 to provide long-term benefits to soil resources. Proposed management practices would include improving grass cover in open areas and closing unnecessary roads. Proposed habitat enhancement activities, timber harvesting, and mechanical land clearing or site preparation would have the potential to disturb soils; however, these short-term impacts would be minimized by following BMPs such as quickly reseeding or replanting disturbed sites with appropriate native plant species and avoiding impacts to sites with erodible soils.

4.2.3 Water Resources

Selecting the proposed action would result in positive effects on water resources from review of permitting requirements, compliance with wetlands regulations, and project implementation. Under Alternative 2, water resources would continue to be protected in accordance with state and federal water quality and wetlands protection laws. Additional projects that would enhance water quality include planting and maintaining riparian buffers and shoreline erosion control. Avoiding development in wetland areas and forest riparian buffers and implementing other BMPs would minimize impacts to water quality and wetlands from sedimentation. In addition, wetlands protection would enhance groundwater recharge, surface water quality, and flood protection.

4.2.4 Coastal Zone Resources

There would be a benefit to coastal zone resources under the proposed action. Riparian forest buffer enhancements and shoreline erosion control projects would protect and enhance coastal zone resources of the Station. A coastal zone consistency determination (CCD) would be sought for any project or action likely to affect use of lands or waters, or natural resources of Virginia's coastal zone and all projects and actions would be consistent to the maximum extent practicable with the Virginia CRMP.

4.2.5 Vegetation Resources

Under the proposed action, there would be overall positive impacts to vegetation resources at NWS Yorktown. Forest stand improvement, invasive/pest species control, restoration of demolition sites, and implementation of beneficial landscaping would provide short- and long-term benefits to vegetative communities. Initiating the development of an urban forest management plan would significantly improve urban forest conditions and reduce storm impacts to infrastructure. Potential problems such as loss of nontarget species from chemical control of invasive plant species would be avoided by using appropriate application methods, adhering to label instructions, and using appropriate, approved herbicides. In addition, only certified pesticide applicators would be permitted to apply pesticides as required by law.

4.2.6 Wildlife Resources

Selecting the proposed action would result in positive effects on wildlife populations and habitats from game and nongame management activities such as deer population management, fish population surveys, and integration of wildlife and forest management requirements. Stewardship management activities, such as maintaining large areas of the Station as early successional habitat and converting a portion of open areas to native warm season grasses, would benefit bird and wildlife resources on NWS Yorktown. In addition, concurrence on development of the INRMP from the USFWS and VDGIF would further increase the benefits to wildlife resources under the proposed action.

4.2.7 Threatened and Endangered Species

Implementation of the proposed action would have no effect on federally listed species at NWS Yorktown. All state and federal threatened and endangered species protection laws would continue to be implemented under the proposed action. Additional benefits would be provided to state listed species by projects designed to enhance rare species habitat and through the protection of significant natural communities as indicated in the special interest area maps presented in the INRMP. In addition, NWS Yorktown would continue to coordinate with the USFWS to ensure compliance with bald eagle protection guidelines. The USFW and VDGIF have concurred with implementation of the proposed action (Appendix C).

4.2.8 Cultural Resources

Implementation of the proposed action would result in positive effects from integration with the cultural resources management plans for WPNSTA and CAX. Cultural resources maps provided in the INRMP would help avoid impacts to known cultural resources on the Station. Under the proposed action, NWS Yorktown would continue to review projects that involve ground-disturbing activities with the potential to impact cultural resources. Section 106 consultations with the SHPO would be conducted when determined necessary.

4.2.9 Air Quality

Under the proposed action, impacts to air quality would be the same or slightly greater than the no action alternative. Prescribed burning would continue to be the only activity proposed in the INRMP with the potential to impact air quality. Prescribed fire would be used on approximately the same number of acres for forest management purposes; however, there would be an increase in prescribed fire use for habitat management. Prescribed fires would be implemented in compliance with all applicable laws and regulations related to air quality, including the 1998 EPA Interim Air Quality Policy of Wildland and Prescribed Fires, to minimize air pollutant emissions and prevent deterioration of air quality and NAAQS violations. Potential air quality impacts have been addressed by conducting an applicability analysis and estimating emissions.

Applicability Analysis

The major pollutants from prescribed fires would be particulate matter (PM_{10}), CO, and VOCs. NO_X emissions would be emitted at a relatively low rate and SO_X emissions would be negligible (EPA 1996). To ensure federal actions do not interfere with the state's timely attainment of the NAAQS, the CAA requires that federal agencies demonstrate that their actions in nonattainment and maintenance areas conform to the purposes of the SIP.

Section 93.153 of the General Conformity Rule of the CAA sets the applicability requirements for projects subject to the rule through the establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant nonattainment area designations. Projects below the *de minimis* threshold are not subject to the rule, while those at or above the levels are required to perform a conformity analysis as established in the rule.

To determine the applicability of the General Conformity Rule to the proposed action, potential emissions were estimated for the ozone precursor pollutants NO_x and VOC. VOC emissions are represented by total hydrocarbon (as methane [CH_4] a primary source of VOC from wildfires). The *de minimis* for maintenance ozone areas outside an ozone transport area is 100 tons per year for each ozone precursor pollutant. Emissions from other management activities, such as heavy equipment operation and soil disturbance, were considered to be negligible and were not included in this analysis. The following assumptions and methodology were used to estimate potential emissions from the proposed action:

- Emissions factors were based on estimated fuel consumed by wildfires in forests in the southern United States (EPA 1996).

- Emissions were estimated using the following equation, in accordance with EPA procedures for estimating atmospheric emissions from forest fires:

  $E_i = P_i LA$

  Where:

  P_i = yield for pollutant "i" (mass of pollutant/unit mass of forest fuel consumed)
  = 24 pounds/ton for total hydrocarbon (as CH_4)
  = 4 pounds/ton as NO_x
  L = fuel loading consumed (average fuel loading for the southern United States is 9 tons/acre [mass forest fuel/unit land area burned])
  A = land area burned
  E = total emissions of pollutant "i" (mass pollutant)

Total estimated emissions for CH_4 and NO_x would be 0.12 tons per acre burned and 0.02 ton per acre burned, respectively. As shown in Figure 4-1, the *de minimis* value of 100 ton per year for CH_4 would be exceeded if controlled burning were conducted on more than 900 acres per year. The *de minimis* value for NO_x would not be exceeded. Under no circumstances would the number of acres burned approach 900 acres and exceed the *de minimis* levels for CH_4 emissions. Therefore, impacts to air quality would not be significant and the General Conformity Rule does not apply to the proposed action.

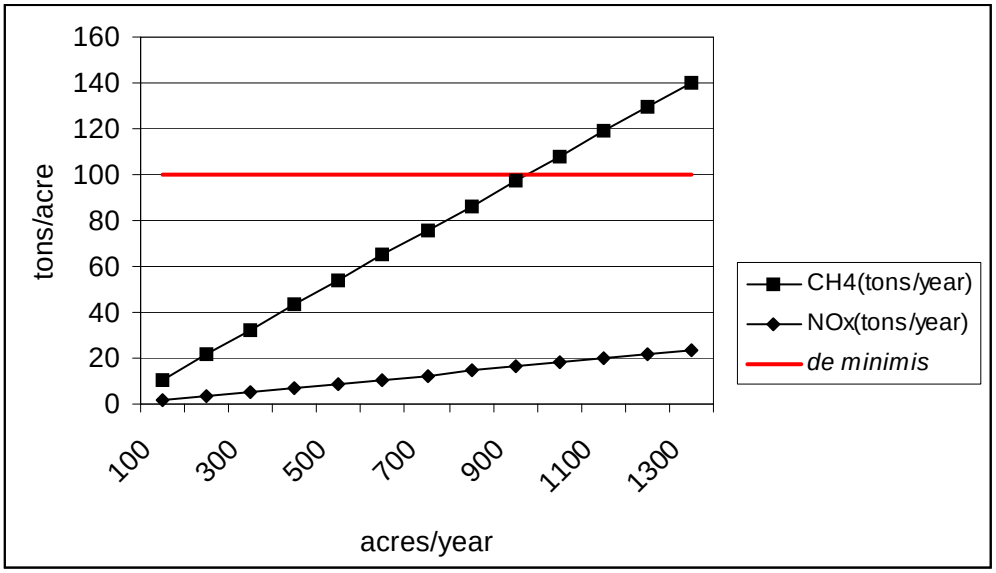

Figure 4-1. Estimated Methane (CH_4) and Nitrogen Oxides (NO_x) Emissions from Wildfires in the Southern U.S.

4.2.10 Socioeconomics and Environmental Justice

As with the no action alternative, Alternative 2 would have little effect on population, income, or employment in the region other than small revenues given to the county from timber sales. Nor would the proposed action have a disproportionately high or adverse impact on minority or low-income populations, nor pose environmental health or safety risks that would disproportionately affect children. The outdoor recreational opportunities provided by the natural resources program would continue to improve the quality of life for Station personnel, their dependents, and the local community. Recreational opportunities would increase somewhat under this alternative because of the proposed construction of fishing piers at two of the Station's lakes.

4.3 Cumulative Impacts

Cumulative impacts are the incremental impacts of an action when added to the impacts of other federal or nonfederal past, present, or reasonably foreseeable future actions. Implementation of natural resources management projects recommended in the proposed action and no action alternative would not result in negative cumulative impacts to the environment at or in the vicinity of NWS Yorktown.

In addition to the current management practices conducted at the installations, the proposed action would implement projects that directly support regional ecosystem management initiatives and would enhance and protect the human and natural environment, including state and federally listed threatened and endangered species. Monitoring programs, annual reviews, and five-year updates of the INRMP would allow continuous reassessment of management goals and objectives (adaptive management) and would help to avoid undesirable cumulative impacts. Additionally, appropriate NEPA procedures and coordination with stakeholders such as the USFWS and VDGIF would be undertaken for any actions that could result in cumulative impacts.

NWS Yorktown is one of 22 Navy installations in the Navy's Mid-Atlantic region. In order to resolve conflicts between current and future planned actions on Navy lands and optimize use of Navy land, facilities, and infrastructure to achieve maximum cost effectiveness and operational efficiency, the Navy has developed a Regional Shore Infrastructure Plan (RSIP) (U.S. Navy 2002a). The proposed INRMP complements this regional planning effort and provides information on natural resource issues that must be considered in developing an overall regional vision and land use zones. In the event that a proposed land use change would arise from the RSIP or a change to the RSIP, that project would be the subject of a separate NEPA analysis. Part of that analysis would assess impacts, if any, to natural resources subject to the INRMP. Other regional and base environmental protection and land use planning initiatives consulted during the development of the proposed INRMP that would avoid or minimize cumulative impacts and conflicts in management include the:

- Navy Mid-Atlantic Region Pesticide Compliance and Pest Management Plan;
- IRP Site Management Plan for WPNSTA, CAX, and YFT;
- Storm Water Pollution Prevention Plans for WPNSTA, CAX, and YFT;

- ICRMP for WPNSTA;
- HARPP for CAX; and
- Spill Prevention, Control, and Countermeasures Plans for WPNSTA, CAX, and YFT.

4.4 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (such as energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (such as extinction of a threatened or endangered species or the disturbance of a cultural resources site).

For the proposed action, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term and temporary, or longer lasting but negligible. Implementation of the proposed action would, however, require the use of energy for natural resources management activities. This energy would be in the form of fossil fuels and labor and would be used as these activities continue.

5.0 COORDINATION AND PUBLIC INVOLVEMENT

In accordance with the SAIA, NWS Yorktown has worked cooperatively with the USFWS and VDGIF to ensure that the INRMP reflects the mutual agreement of these parties concerning the conservation, protection, and management of fish and wildlife resources on the Station. Draft copies of the INRMP were provided to these agencies and the general public for review. All comments (Appendix C) were considered in the preparation of the final INRMP. The VDGIF supported the reduction of mowing and introduction of warm season grasses, and recommended mowing in the late summer and prescribed burning in winter to avoid interfering with nesting success for most grassland species. The VDGIF also supported the establishment of 300-foot buffer zones around potential Mabee's salamander habitat and recommended only allowing selective cuts or thinning within 600 feet of potential habitat. Finally, the VDGIF recommended NWS Yorktown establish long-term population monitoring protocols for reptiles and amphibians. The USFWS concurred with the INRMP with no further comments. The draft INRMP was placed in the Tabb Public Library for one month and a notice announcing its availability was published in *The Daily Press* newspaper for three days early in the review period (see Appendix C). No comments were received from the public.

The following persons and agencies were consulted in preparation of the INRMP.

Federal Agencies:
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APPENDIX A

Applicable Laws and Regulations

Navy Instructions and Policies Related to Natural Resources

OPNAVINST P80.3-Airfield Safety

OPNAVINST 5090.1B CH 3- Environmental Natural Resources Program Manual

OPNAVINST 6250.4A -Pest Management Program

DoD Publications Related to Natural Resources

DoD Directive 4150.7-Pest Management

DoD Directive 4165.59-DoD Implementation of the Coastal Zone Management Program

DoD Instruction 4700.2-Secretary of Defense Awards for Natural Resources and Environmental Management, 15 Jul 1988

DoD Instruction 4715.3-Environmental Conservation Program, 3 May 1996

DoD Instruction 4715.9-Environmental Planning and Analysis, 3 May 1996

EOs Related to Natural and Cultural Resources Management

EO 11593-Protection and Enhancement of the Cultural Environment, 13 May 1971

EO 11644-Use of Off-Road Vehicles on the Public Lands, 8 Feb 1972

EO 11988-Floodplain Management, 24 May 1977

EO 11989-Off-Road Vehicles on Public Lands, 24 May 1977

EO 11990-Protection of Wetlands, 24 May 1977

EO 12777-Implementation of the Federal Water Pollution Control Act and Oil Pollution Act, 18 Oct 1991

EO 12898-Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 11 Feb 1994

EO 12962-Recreational Fisheries, 7 Jun 1995

EO 13112-Invasive Species, 3 Feb 1999

EO 13148-Greening the Government, 14 Sep 1998

Federal Statutes Related to Natural and Cultural Resources Management

American Indian Religious Freedom Act of 1978 (42 USC § 1996)

Antiquities Act of 1906 (16 USC § 431-433)

Animal Damage Control Act (7 USC § 426-426b)

Archaeological Resources Protection Act of 1979 (16 USC § 470aa-470mm)

Bald and Golden Eagle Protection Act of 1940 (16 USC § 668 et seq.)

Endangered Species Act of 1973, as amended (16 USC § 1531-1544)

Farmland Protection Act (7 USC § 4201 et seq.)

Federal Facilities Compliance Act (42 USC § 6901 et seq.)

Federal Insecticide, Fungicide, and Rodenticide Act as amended (7 USC § 136 et seq.)

Federal Land Policy and Management Act of 1976 (43 USC § 1701)

Federal Noxious Weed Act of 1974 (7 USC § 2809 et seq.)

Federal Water Pollution Control Act (Clean Water Act) as amended 1987 (33 USC § 1251-1387)

Fish and Wildlife Conservation Act of 1980 (16 USC § 2901 et seq.)

Fish and Wildlife Coordination Act (16 USC § 661 et seq.)

Forest and Rangeland Renewable Resources Planning Act of 1974 (16 USC § 1601 et seq.)

Lacey Act of 1900 (16 USC § 701; 31 Stat. 187, 32 Stat. 285)

Migratory Bird Conservation Act of 1918 (16 § USC 715)

Multiple Use Sustained Yield Act of 1960 (16 § USC 528 et seq.)

National Environmental Policy Act of 1969 (42 § USC 4321 et seq.)

National Forest Management Act of 1976 (16 § USC 1600 et seq.)

National Historic Preservation Act (16 USC § 470 et seq.)

Rivers and Harbors Act of 1899 (33 USC § 401 et seq.)

Safe Drinking Water Act (42 USC § 201 et seq.)

Sikes Act, as amended 1997 (16 USC § 670a-670f)

Soil and Water Conservation Act (16 § USC 2001)

Timber Sales on Military Lands (10 USC § 2665)

Wild and Scenic Rivers Act (16 USC § 1274 et seq.)

Wilderness Act of 1964 (16 USC § 1131-1136; 78 Stat. 890)

APPENDIX B

Project Summary Table

APPENDIX B

Instructions/Guidances

Enclosure 1 NEPA Environmental Checklist
Enclosure 2 COMNAVREG MIDLANT INSTRUCTION 11015.3

PROJECT/PLANNING
ENVIRONMENTAL CHECKLIST

The following checklist is designed to assist personnel in determining whether or not there are potential environmental concerns associated with projects occurring at their installation. Please provide DD-1391 or Scope of Work (SOW) and site maps associated with this action. Upon completion please forward to the Regional Environmental Group NEPA Program. The NEPA Program Manager, Mr. Joe Vlcek, phone 462-8564 ext. 387 or e-mail vlcekja@pwcnorva.navy.mil , will evaluate and respond within 2 weeks of receipt and will be your point of contact for all environmental issues associated with this project

1. Name of Project:_____ Project Number:_____

2. Activity requesting Project: _____

3. Activity POC/phone _____/_____

4. Brief Description of the Project (Proposed Action): Attach 1391, SOW, or other project description.

_____
_____
_____
_____

5. When is project due for funding? _____

6. When is project scheduled to begin or to be awarded? _____

_____	_____	_____
Checklist Preparer (Print Name)	Checklist Preparer (Signature)	Date Completed

To be completed by Environmental NEPA Program Manager

1. Concur with Checklist: ___yes ___ no
   If no, discrepancies:

2. Environmental Actions Required:
   - CATEX yes no
   - EA / EIS yes no
   - CCD yes no
   - RONA yes no
   - Env Permits / Notifications: yes no
   - Other Env. Concerns: yes no

3. Additional Comments:

_____	_____	_____
NEPA/Environmental Evaluator (Print Name)	NEPA/Environmental Evaluator (Signature)	Date

National Environmental Policy Act (NEPA):

NEPA is the national charter for protection of the environment. NEPA ensures that environmental information is available to decision-makers and identifies reasonable alternatives to actions that have the potential to have significant environmental impacts. The following questions will help determine what level of NEPA documentation is required.

Yes	No	Unsure	
			1. Will the action (negatively) affect public health or safety?
			2. Will the action significantly effect the human environment, or be controversial? *(Example: Will the community object to the proposed action? Will traffic, noise, or pollution increase in the community? Will the demolition of the golf course be publicly controversial? Note: The human environment is interpreted to include the natural/physical environment and the relationship of people with that environment (including economic and social aspects).*
			3. Will the action establish precedents for future actions with significant effects? *(Example actions include: Establishing New Bombing Ranges, Demolishing Historic Bldgs)*
----------			4. Will the action have the potential to impact:
			A. Wetlands: (*Is an Army Corp of Eng. permit required (action not covered under regional or nationwide permit? or Will the project violate the Navy's "No Net Loss" wetland policy.)*
			B. Endangered Species: (*Would the National Marine Fisheries Service or US Fish & Wildlife Service oppose a "No Adverse Effect" determination for threatened or endangered species or critical habitat; ---- If no threaten or endanger species inhabit the area —then answer - NO .)*
			C. Archeological or Historical Sites: *(Would the State Historic Preservation Office oppose a "No Adverse Effect" determination)*
			D. Remediation Efforts: (*Does the action conflict with remediation plans or activities, such as those that occur under the Installation Restoration (IR) program)*
Resulting Actions			• **If any of the above are "Yes" or "Unsure" an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) may be required. Contact the Regional Environmental Group to assist and coordinate this effort.** • **If all responses are "No" it is appropriate to assume that the proposed action will not have a significant environmental effect. For these instances, the appropriate level of NEPA documentation is Categorical Exclusion (CATEX) to NEPA requirements. State the CATEX that applies for this action. One of the most commonly used CATEXs is printed below as an example.**

CATEX Applies		
Yes	No	Categorical Exclusions (CATEX) are found in OPNAVINST 5090.1B CH-2, Chap 2 Sect 2-5.2(e)
		(i). New construction that is consistent with existing land use and, when completed, the use or operation of which complies with existing regulatory requirements. (For example: a building on a parking lot with associated discharges/runoff that are within existing handling capacities; a bus stop along a roadway; and a foundation pad for portable buildings within a building complex.
		(__):

Coastal Zone Management Act (CZMA):

The federal consistency requirement of the CZMA, requires federal actions that have the potential to effect coastal resources to be consistent to the maximum extent practical with state and local regulations. The following questions will help determine what level of Coastal Consistency Determination (CCD) is required.

Yes	No	Unsure	
			1. Will the action, (regardless of its location) have a direct/immediate or indirect/delayed effect on natural resources, land uses or water uses in the State's coastal zone. Effects are not just environmental effects, but include effects on coastal uses. The Coastal Zone is defined as coastal waters and extends inland from the shorelines only to the extent necessary to control shore-lands.
Resulting Actions			• **If "Yes" or "Unsure" a CCD may be required. Contact Env. for assistance** • **If "No" a CCD is not required**

General Conformity Rule and Record of Non-Applicability (RONA)

The Clean Air Act (CAA) prohibits Federal Agencies from engaging in any action, which does not conform to local efforts to control air pollution. The air pollutant of concern in the Hampton Roads region, is ozone. The following questions will determine if a full Conformity analysis or a RONA (Record of Non-Applicability) applies to this project.

Yes	No	Unsure	
			1. Is there a General Conformity Rule exemption (40 CFR 51.853) that applies?
Resulting Actions			• **If "Yes" – Stop and complete RONA citing exemption;** • **If "No" go to next question;** • **If "Unsure" contact Environmental for assistance**
Yes	No	Unsure	
			2. Are both VOC & NO_x emissions, resulting from this action below 100 tons per year?
Resulting Actions			• **If "Yes" – Stop and complete RONA citing calculations;** • **If "No" or "Unsure" contact Environmental for assistance.**

Other Environmental Concerns that can Influence Planning or Design

The following environmental issues have to potential to impact the project during the planning or design phase.

Yes	No	Unsure	
			1. Will the project disturb soil or unpaved land? If yes, list approximate size:
			2. Will the project take place in, near or over a waterway If yes, list the body of water:
			3. Does the project involve the disturbance of petroleum-contaminated soil or groundwater?
Resulting Actions			• **If "Yes" or "Unsure" the action may affect natural resource or require additional funding. Contact Environmental for more details.** • **If "No" – no environmental action is required**

Environmental Permits and Notifications

The following environmental issues may not impact planning or design phase, but must be addressed prior to project execution.

Yes	No	Unsure	
			1. Will the project result in the installation of any equipment that will be classified as an air emission source: *(Examples of air emissions sources include but are not limited to: Abrasive blast glovebox/booth; Boilers; Dry Cleaning Equipment; Firing Ranges; Fuel fired equipment (ex. space heaters, pumps, compressors); Gasoline/fuel dispensing devices; Generators; Incinerators; Laboratory Equipment; Paint Booths; Solvent Cleaning/Degreasing Units; or Woodworking Equipment)*
			2. Will the project involve the installation or demolition of petroleum product storage tanks in quantities of 55 gallons or greater?
			3. Will the construction, demolition or operation phase of this project generate waste that will require disposal?
			4. Will the construction or demolition phase of this project generate material that can be recycled (concrete, steel, etc)?
			5. Will the project result in the installation of any new processes or activities that require a connection to the storm-water system? If yes, list the process:
			6. Will the project result in the installation of any new industrial processes that require a connection to the sanitary sewer system? If yes, list the process
Resulting Actions			• **If "Yes" or "Unsure" an environmental permit or state notification may be required.** • **If "No – no environmental action is required**

COMNAVREG MIDLANT
INST 11015.3
REG ENG Code 90

COMNAVREG MIDLANT INSTRUCTION 11015.3

Subj: NATURAL RESOURCES MANAGEMENT FOR FISH AND WILDLIFE, FERAL ANIMALS, INVASIVE SPECIES, AND CERTAIN PESTS

Ref: (a) E.O. 13112
(b) NAVFAC P-73, Vol. II
(c) OPNAVINST 5090.1B
(d) 18 U.S. Code § 42
(e) 16 U.S. Code §§ 703-704
(f) 16 U.S. Code §§ 668-668c
(g) 16 U.S. Code § 1361, *et seq*.
(h) 50 C.F.R. pt. 10
(i) 50 C.F.R. pt. 21
(j) SECNAVINST 6401.1A
(k) NASOCEANAINST 3750.2A

1. Purpose. To prescribe procedures and assign responsibility for management and control of fish and wildlife, feral animals, invasive species, and certain pests within the COMNAVREG MIDLANT area of responsibility. This includes the areas of Naval Weapons Station (WPNSTA) Yorktown (including Cheatham Annex); Naval Air Station (NAS) Oceana (including Naval Auxiliary Landing Field [NALF] Fentress, Camp Pendleton, and Dam Neck Annex); Naval Station (NAVSTA) Norfolk (including St. Julien's Creek Annex and St. Helena Annex); Naval Support Activity (NAVSUPPACT) Norfolk (including Northwest Annex); Naval Amphibious Base (NAVPHIBASE) Little Creek; Fleet and Industrial Supply Center (FISC) Norfolk (Craney Island Fuel Depot and Yorktown Fuel Terminal); and Naval Shipyard (NAVSHIPYD) Norfolk (only New Gosport Annex, Scott Center Annex, and South Gate Annex).

2. Policy

a. Per references (a) through (c), the Navy is authorized to take measures to control invasive species.

b. References (d) through (g), the Lacey, Migratory Bird Treaty, Eagle Protection, and Marine Mammal Protection Acts, respectively, protect designated wildlife and control activity involving protected wildlife parts. Violations of these statutes may result in criminal prosecution. Regulations contained in references (h) and (i) implement reference (e) and list species protected by Federal law. Reference (j) describes government responsibility for preventing injury and diseases from animals.

3. Definitions

a. Per reference (a), an “invasive species” is a species that is non-native (or alien to the ecosystem under consideration), and whose introduction causes, or is likely to cause harm to economic, environmental, or human health.

b. Per reference (e), “take” means to pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.

c. Per reference (c), “pest” refers to any organism (except for microorganisms that cause human or animal diseases) that adversely affects the well-being of humans or animals, attacks real property, supplies, equipment or vegetation, or is otherwise undesirable.

d. Per reference (j), “feral” refers to wild animals and unowned dogs, cats, or other domestic animals.

4. Responsibilities

a. Regional Engineer. The Commanding Officer, Navy Public Works Center/Regional Engineer (PWC/RE), Norfolk, as the Regional Environmental Program Manager, is responsible for management and control of, and for providing services pertaining to, fish and wildlife, feral animals, invasive species, and pests. On behalf of COMNAVREG MIDLANT, the Regional Engineer obtains natural resources permits required by Federal law to carry out this program. Regional Engineer authority, in natural resources matters, may be sub-delegated to a properly trained Regional Natural Resources Program Manager, under the supervision of the Regional Environmental Group Head.

(1) Environmental Services Desk. The PWC/RE Environmental Group provides pest management services through the Environmental Services Department. In addition, the Environmental Services Department responds to routine service calls for removal of non-migratory birds and control of feral animals. These services may be requested through the Environmental Services Desk at (757) 444-7528 during working hours and (757) 444-3477 after hours. Requests for services involving animals, such as sea turtles, marine mammals, game animals and migratory birds or raptors, not under the purview of the Environmental Services Department will be referred by Service Desk personnel to Natural Resources Managers.

(2) Natural Resources Managers. Under the direction of the Regional Natural Resources Program Manager, installation Natural Resource Specialists use integrated management practices and procedures to manage fish and wildlife and control certain feral, nuisance and invasive species. Per reference (k), Natural Resources personnel also develop and execute depredation and

dispersal procedures for Bird Animal/Aircraft Strike Hazard (BASH) purposes, and personally supervise these activities when lethal methods are required. Natural Resources Managers, and all other PWC/RE personnel involved in lethal control activities, must be properly trained and duly certified for all weapons employed in accordance with applicable regulations. These personnel are located in Storefront Compliance Departments of the Regional Environmental Group. Natural Resources personnel will also identify bird and/or other animal remains associated with aircraft mishaps in accordance with reference (k).

(3) Conservation Officers. Under the direction of Natural Resources Managers, Conservation Officers enforce fish and wildlife and other natural resources laws and regulations. They may conduct field inspections and employ approved control methods for certain species. Control measures include, but are not limited to, live trapping, relocation, and lethal methods. Conservation Officers also perform wildlife forensic investigations and respond to wildlife damage complaints.

b. NAVSHIPYD Norfolk. Pest control services for NAVSHIPYD Norfolk are currently provided through government contract; these services may be requested through LANTNAVFACENGCOM at (757) 396-5121, extension 200.

c. Security Officers. Security Officers respond to emergency wildlife complaints and requests for services. Security Officers are an after-hours emergency contact point for Natural Resources Managers, Conservation Officers, and pest management personnel. Within existing resources and according to established training priorities, Security Officers also assist Natural Resources personnel in obtaining required weapons qualifications.

d. Airfield Facilities Division Officer. All bird/animal strikes should be investigated and reported in accordance with reference (k). Animal remains will be collected by the Airfield Facilities Division Officer and placed in appropriate BASH freezers located in Building 102 at NAS Oceana and LP-167 at Chambers Field, NAVSTA Norfolk.

e. Aviation Squadrons. All bird strikes must be reported in accordance with reference (k). Airfield Facilities or Natural Resources should be immediately contacted following any strike to ensure bird/animal remains are collected and identified.

5. Review. The Regional Natural Resources Program Manager is responsible for review and update of this instruction.

G. E. EICHERT
Chief of Staff

Distribution: COMNAVBASENORVA/SOPA(ADMIN)HAMPINST 5216.2X):
List X

Stocked by PWC NORFOLK VA/COMNAVREG MIDLANT

DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION, MID-ATLANTIC
6506 HAMPTON BLVD.
NORFOLK, VA 23508-1273

IN REPLY REFER TO:

COMNAVREG MIDLANT
INST 11015.2A
REG ENG Code 90
12 NOV 2002

COMNAVREG MIDLANT INSTRUCTION 11015.2A

Subj: HUNTING AND TRAPPING PROGRAM

Ref: (a) 16 U.S. Code § 670 *et seq.*
(b) 10 U.S. Code § 2671
(c) 32 C.F.R. Part 190
(d) 29.1 VA Code Chapters 3 and 5; 4 VA Admin. Code, Agency 15 (Dept. of Game and Inland Fisheries)
(e) NC General Statutes, CH. 113, Subchapters 3 and 4
(f) 50 C.F.R. Chapter 1, Subchapter B
(g) OPNAVINST 5090.1B, Chapter 22
(h) NAVSEA OP-5, Vol. 1, § 2-1.6
(i) JAGMAN

Encl: (1) Station Permit Suspension/Revocation
(2) Hunter Application Form
(3) Qualification Proficiency Standards
(4) Deer Hunting on NAS Oceana or Dam Neck Annex
(5) Deer Hunting on NALF Fentress
(6) Deer Hunting on WPNSTA Yorktown
(7) Deer Hunting on Cheatham Annex
(8) Deer Hunting on NAVSUPPACT Norfolk, Northwest Annex
(9) Waterfowl Hunting on Dam Neck Annex
(10) Spring Turkey (Gobbler) WPNSTA Yorktown
(11) Spring Turkey (Gobbler) Hunting on Cheatham Annex
(12) Small Game Hunting on NAS Oceana
(13) Small Game Hunting on NALF Fentress
(14) Small Game Hunting on NAVSUPPACT Norfolk, Northwest Annex
(15) Small Game Hunting on WPNSTA Yorktown
(16) Dove Hunting on NAS Oceana, NALF Fentress, and NAVSUPPACT Norfolk, Northwest Annex
(17) Trapping at NAS Oceana, NALF Fentress, Dam Neck Annex, and NAVSUPPACT Norfolk, Northwest Annex

1. Purpose. To regulate hunting and trapping on board Naval Weapons Station (WPNSTA), Yorktown, including Cheatham Annex; Naval Air Station (NAS), Oceana, including Dam Neck Annex and Naval Auxiliary Landing Field (NALF), Fentress; and Naval Support Activity (NAVSUPPACT), Norfolk, Northwest Annex.

2. Cancellation. NSGANWINST 11015.2D; COMNAVREGMIDLANTINST 11015.2.

3. Policy

a. Reference (a) requires sustainable, multi-purpose use of natural resources on naval installations, consistent with combat readiness. These uses can include hunting and trapping and must conform to safety and security requirements and provide for public access.

b. Reference (b) requires compliance with Federal and State hunting laws, prescribes that State hunting licenses must be obtained if State law authorizes licenses for non-resident active duty personnel on the same terms as residents, and grants access to Naval installations by State wildlife management officials.

c. Reference (c) implements reference (a), providing, among other things, for public access to naval installations, unless a specific determination is made that safety or security reasons prohibit, or carrying capacity of wildlife resources precludes such access. Reference (c) also provides that hunting and trapping fees collected pursuant to reference (a) shall be used only to defray the costs of wildlife management programs at the installation collecting the fees. Collection, handling, and disbursement of funds shall comply with requirements prescribed by Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM) and the Regional Comptroller Office.

d. Hunting and trapping on board WPNSTA Yorktown and Cheatham Annex; NAS Oceana, Dam Neck Annex, and NALF Fentress; and NAVSUPPACT Norfolk, Northwest Annex shall comply with references (d) or (e), Virginia and/or North Carolina hunting and trapping laws and regulations per reference (f). The U.S. Fish and Wildlife Service regulations pertain to endangered and threatened species and migratory birds per reference (g), the Navy's Natural Resources Program instruction. Reference (h) places special limits on hunting and trapping in the vicinity of explosives handling and storage areas.

e. Hunting and trapping safety, to include the security of personnel, operations, and facilities, are matters within the authority and responsibility of Installation Commanders (ICs). Suspected violations of Federal and State statutes and regulations shall be reported to the cognizant Natural Resources Manager or to Naval law enforcement personnel. These violations will be investigated with a view to referral to the United States Attorney or, depending on the nature of the suspected violation, to Virginia civil authorities. Other suspected violations of this Instruction, not amounting to a violation of Federal or State law, shall be investigated and forwarded to the cognizant IC for disposition. As required by reference (c), investigation and enforcement may be conducted only by properly trained Federal

and State personnel under the direction of, or in coordination with, Natural Resources Managers. Enclosure (1) pertains.

f. Hunting and trapping related incidents involving personal injury or property damage, especially those with potential to result in claims for or against the Government, shall be investigated and adjudicated as per reference (i). ALL HANDS ARE REMINDED TO REPORT SUCH INCIDENTS PROMPTLY. Initial reports of the occurrence of personal injury or property damage may be made by the most expeditious means available to Natural Resources Managers, Hunt Captains, security, medical emergency, or law enforcement personnel, Command Duty Officers (CDOs), and others in the IC chain of command.

g. Acceptance of a permit to hunt or trap on board any Commander, Navy Region, Mid-Atlantic (COMNAVREG MIDLANT) installation constitutes consent to inspection at any time by Navy, Federal, and State authorized personnel for purposes of safety, security, and/or compliance with the statutes and regulations referenced in this instruction. Enclosure (2) will so specify.

4. Responsibilities

a. Regional Engineer (PWC Norfolk)

(1) Natural Resources Manager. The Natural Resources Managers are responsible for managing fish and wildlife resources to include control of game harvesting and the designation of hunting/trapping areas. The Natural Resources Managers and Conservation Officers resolve disputes involving ownership of harvested game and enforce all Federal, State, and local game laws and regulations.

Subject to 10 U.S. Code § 1588, Natural Resources Managers are authorized to accept voluntary services in support of hunting and trapping-related natural resources programs, functions, and activities. This includes, without limitation, Hunt Captains at WPNSTA Yorktown, operating and maintaining the archery range at NAS Oceana (Building 78), conducting hunter qualification programs, and investigating alleged violations of hunting and trapping laws and regulations.

(2) Designated Conservation Officers. Conservation Officers are trained personnel assigned to the Regional Engineer's storefront compliance departments who, acting under the Natural Resources Managers, are responsible for enforcing Federal, State, and local wildlife laws and regulations. Conservation Officers are authorized to conduct game and hunter

inspections to determine compliance with all applicable laws, regulations, and policies.

b. Regional Public Safety Program Manager. Security Officers at NAS Oceana; NAVSUPPACT Norfolk, Northwest Annex; and WPNSTA Yorktown will provide hunter check-in and check-out assistance and support Natural Resources Managers and Conservation Officers with law enforcement issues upon request.

c. Hunters and Trappers. Acceptance of a permit to hunt or trap on board a COMNAVREG MIDLANT installation constitutes consent to abide by Federal and State statutes and regulations incorporated herein by reference, and directives of Natural Resources Managers, Hunt Captains, and Conservation Officers. Enclosure (2) will so specify.

5. General

a. Authorized Personnel. For reasons of safety, security, and resource carrying capacity, only the following persons are authorized to hunt and trap on WPNSTA Yorktown, Cheatham Annex; NAS Oceana, NALF Fentress, and Dam Neck Annex; and NAVSUPPACT Norfolk, Northwest Annex:

(1) Active duty military personnel and their dependents.

(2) Retired military personnel and their dependents.

(3) Federal civilian employees at COMNAVREG MIDLANT installations and their dependents.

(4) Reservists and their dependents.

(5) Retired Federal civilian employees at the installation from which they retired.

(6) The above-listed authorized personnel may sponsor one guest while hunting white-tailed deer or turkey, or two guests while hunting small game. Additional security measures may be required for guests to hunt. Contact appropriate Natural Resources staff for details: WPNSTA Yorktown (757) 887-7605, NAS Oceana/NALF Fentress/Dam Neck Annex (757) 433-2151, and NAVSUPPACT Norfolk, Northwest Annex (757) 421-8043.

(7) In instances where demand for a hunting activity exceeds availability, active duty personnel will be assigned to available slots prior to other applicants.

b. Hunting Equipment

(1) General. Shotguns, bows and arrows may be brought onto a station only by those given permission to hunt and then only the day of an authorized hunt. At WPNSTA Yorktown and Cheatham Annex, off-station residents must have permission in advance from the Security Officer to bring weapons on board for practicing, qualifying, etc. on days other than hunting days. Off-station residents will remove weapons from the station immediately upon securing from hunting or checking out from the Hunt Station.

(2) Firearms

(a) The use of centerfire and rimfire rifles or handguns for hunting is prohibited on all installations covered under this instruction.

(b) Shotguns may be used for deer hunting at designated areas on WPNSTA Yorktown; Cheatham Annex; NALF Fentress; Dam Neck Annex; and NAVSUPPACT Norfolk, Northwest Annex and for small game hunting at all installations covered under this instruction. With the exception of waterfowl, there is no small game hunting on Dam Neck Annex. There is no squirrel hunting on NAVSUPPACT Norfolk, Northwest Annex.

(c) Shotguns must be 10-gauge or less, the magazines of which have been cut off or plugged so the gun will hold no more than three shells - chamber and magazine combined. A minimum 20-gauge is required for deer hunting.

(d) Muzzleload firemarms for the special NAS Oceana, NALF Fentress and Dam Neck Annex, and NAVSUPPACT Norfolk, Northwest Annex hunts shall comply with current Virginia or North Carolina regulations.

(e) It is prohibited to transport a loaded firearm in a vehicle or to carry a loaded firearm on a hard surface road.

(3) Ammunition

(a) Shot size #7½ or less must be used for doves and upland birds. Waterfowl hunters must use steel or other federally-approved non-toxic alternatives to lead shot. Recommended shot size for waterfowl is BB through #6.

(b) Shot size #6 or less is authorized for rabbits, squirrels, and small game other than doves or upland birds.

(c) Buckshot (#1, 0, 00, and 000) is permitted for deer only on WPNSTA Yorktown, Cheatham Annex, NALF Fentress, and Dam Neck Annex. Shotgun slugs are permitted only on NAVSUPPACT Norfolk, Northwest Annex pending hunter qualification with this ammunition.

(d) Turkey hunters are restricted to shot size between #2 and #6.

(4) Archery. Equipment for deer hunting at all locations must be hand-held and hand-drawn (release aids are permitted). Archery equipment shall conform to all applicable regulations in references (d) or (e).

c. Safety/Security Requirements

(1) Hunter Safety

(a) All firearm hunters must have attended a hunter safety course approved by the Virginia Game Division. Proof of successful completion must be presented upon purchase of installation hunting permits.

(b) All bowhunters at NAS Oceana, NALF Fentress, and Dam Neck Annex must produce a certificate of completion from an International Bowhunter Education Program (IBEP) safety course at the time of station permit purchase or during proficiency qualifications. IBEP is strongly recommended for bowhunters at WPNSTA Yorktown and Cheatham Annex.

(2) Blaze Orange

(a) All deer hunters are required to wear blaze orange while walking to and from their stand and while pursuing wounded game. In addition, bowhunters and muzzleload hunters must adhere to all applicable blaze orange requirements specified in references (d) or (e) during the regular firearms season. Outside the regular firearms season, and while on stand, bowhunters and muzzleload hunters must display solid blaze orange material (at least 100 square inches) at shoulder level within arms reach and visible from 360 degrees.

(b) Small game hunters are required to wear applicable blaze orange in accordance with references (d) or (e). Blaze orange is not required while dove or waterfowl hunting, or during the spring turkey season.

(c) During deer and small game season, trappers are required to follow blaze orange requirements as specified above.

(3) Vehicles/Parking

(a) WPNSTA Yorktown and Cheatham Annex. During shotgun deer season at WPNSTA Yorktown, designated Hunt Captains will transport hunters to their hunting area. Each Hunt Captain is responsible for the conduct and safety of his or her group and shall make sure the members of the group follow Federal and State regulations and this instruction. During other seasons, two personal operating vehicles (POVs) will be allowed per hunting area. The Natural Resources staff will register the vehicles and provide a dashboard pass the morning of the hunt authorizing POV entry into the restricted area. During all hunting seasons at Cheatham Annex, designated vehicle parking areas will be described during the indoctrination brief, and vehicle parking passes will be distributed. Hunting while parked in other than designated areas, or failure to display a parking pass while hunting, is prohibited. All parking passes must be returned to Natural Resources when checking out at the conclusion of the hunt.

(b) NAS Oceana, NALF Fentress, Dam Neck Annex and NAVSUPPACT Norfolk, Northwest Annex. Designated vehicle parking areas will be described during the required indoctrination. Vehicle parking passes will be distributed at hunter check-in. Parking in other areas, or without a displayed parking pass, is prohibited.

(4) General

(a) Drive-hunting deer, using hunters as drivers, without permission is prohibited. The Natural Resources Manager may organize and execute man-drives in situations where he deems population management is necessary.

(b) It is prohibited to hunt, carry a loaded weapon, or discharge a weapon within 150 yards of an occupied structure or horse trail, or within 200 yards of exposed working personnel, recreation areas, buffer zones, or roads. Hunting over horse trails is authorized at WPNSTA Yorktown, as trail-riding is not permitted on hunt days.

(c) Hunting or trapping while in possession or under the influence of alcohol, as defined by State law, or of any substance prohibited by Federal or State law, is likewise prohibited. Appropriate action will be taken to address personal accountability for all instances of alcohol and substance abuse. Similarly, smoking is prohibited in all hunting areas and in all Government buildings.

d. Dog Use and Training

(1) Training. As noted in reference (d), the training of dogs-on-live-wild-animals is considered hunting and is unlawful during the closed season.

(2) NAS Oceana, NALF Fentress, Dam Neck Annex and NAVSUPPACT Norfolk, Northwest Annex. Dogs shall not be used to hunt white-tailed deer. Dogs are permitted for use by small game hunters on NAS Oceana, NALF Fentress and NAVSUPPACT Norfolk, Northwest Annex and must be in control of the handler at all times.

(3) WPNSTA Yorktown and Cheatham Annex. Dogs may be used to hunt deer and small game only if approved in advance by the Natural Resources Manager.

(4) Waterfowl. Use of retrieving dogs is permitted and encouraged for waterfowl hunters on Dam Neck Annex although they will not be allowed to roam freely outside hunting locations.

(5) Vaccinations/Ownership. All hunting dogs must have current vaccinations and owner identification on the animal's collar.

e. Tree-Stands. Permanent tree-stands, or those affixed to trees by screws or nails, may be provided at WPNSTA Yorktown, Cheatham Annex, or NAVSUPPACT Norfolk, Northwest Annex. In addition, disabled veterans may contact the Natural Resources Staff at WPNSTA Yorktown regarding the availability of a wheelchair accessible tree stand. Use of this stand is reserved for disabled veterans, but the application process is the same for hunting in general. Permanent stands are prohibited on other COMNAVREG MIDLANT installations. Pruning of small limbs (less than two inches in diameter) is permitted around temporary tree-stands for safe bow limb clearance. Removal of large limbs or trees for creation of shooting lanes is prohibited. All temporary tree-stands, which must be clearly marked with the owner's name and permit number, are to be removed no later than 30 days from the completion of the hunting season.

f. Protected Wildlife. Protected wildlife, as defined by reference (f), such as songbirds, hawks, owls, eagles, gulls, herons, egrets, and vultures shall not be hunted or trapped at any time. Killing, capturing, or harassing other non-game species is prohibited. There shall be no open season on any wildlife except as specified by references (d) or (e) and this instruction.

g. Wildlife Harassment. Unless specifically needed to maintain flightline safety, wildlife harassment is prohibited at all installations.

h. Spotlighting. It is unlawful for any person to cast the rays of an artificial light as a hunting or trapping aid on any station field or woodland area at any time except for routine census checks conducted by the Natural Resources Manager.

i. Injured Wildlife. Injured wildlife shall be immediately reported to the Natural Resources Manager for determination of disposition. Hunters are required to make every possible effort to retrieve wounded deer. On NAS Oceana and NAVSUPPACT Norfolk, Northwest Annex, if a wounded deer is lost, hunters shall notify security. The Natural Resources Manager, Conservation Officers, Hunt Captains, and hunting and trapping program volunteers may offer assistance in tracking, if required.

6. Procedures

a. Hunting Licenses. Each hunter must possess a valid Virginia or North Carolina hunting license as appropriate. A big game license is required for deer and turkey hunting, and a migratory bird stamp and a Virginia Harvest Information Program (HIP) number is required for hunting waterfowl and other migratory birds.

b. Station Permits. In addition to a valid hunting license, a current station hunting permit is required of all persons who hunt or trap on board installations covered under this instruction. Each station permit will cover all authorized small and big game hunting allowed on the installation during the current hunting season. Annual permits are valid concurrent with the hunting licenses from 1 July through 30 June. Additional information on permits and hunting dates is available on the Navy Public Works Center (PWC) Norfolk website, www.norfolk.navy.mil/pwc.

(1) WPNSTA Yorktown and Cheatham Annex. All hunters on WPNSTA Yorktown or Cheatham Annex must possess a WPNSTA Yorktown Hunting Permit. Permits may be obtained for $10 from WPNSTA Yorktown Morale, Welfare and Recreation (MWR), Building 705, and Cheatham Annex MWR, Building 130. This permit covers all small and big game hunting on either unit.

(2) NAS Oceana, NALF Fentress, Dam Neck Annex, and NAVSUPPACT Norfolk, Northwest Annex. All hunters on NAS Oceana, NALF Fentress, Dam Neck Annex, or NAVSUPPACT Norfolk, Northwest Annex must obtain a NAS Oceana Hunting Permit. Hunting and

trapping permits are obtainable only from the Regional Engineer, Oceana Compliance Department staff located at the Natural Resources Center (NRC), Building 78, or Building 404 at NAVSUPPACT Norfolk, Northwest Annex. Permits are available for sale at all scheduled proficiency qualifications and indoctrinations. The cost for a hunting, trapping, or range-only permit is $20 per season. Purchase of a season permit allows use of the Archery Range at the NRC and covers all small game, big game, and waterfowl hunting on these installations.

(3) Upon submitting an application to hunt, individuals shall be required to sign a general release statement that relieves the Federal Government of liability in case of accident or injury. Individuals are responsible for having read and understood all applicable Federal, State, local and installation hunting regulations.

(4) All guests must adhere to application procedures specified in enclosure (2), obtain a valid installation hunting permit, and comply with all applicable qualifications as outlined below. Guests are the responsibility of their sponsor while hunting.

(5) For individuals under 18 years of age, a parent or legal guardian must sign the hunting application. Minors are the responsibility of their adult sponsor who holds a valid hunting permit. Dependents under the age of 12 must be in the same stand or in direct contact with the parent or legal guardian at all times while hunting.

c. Qualifications. Persons wishing to hunt deer with archery equipment, or muzzleloading rifles, or use shotgun slugs at NAVSUPPACT Norfolk, Northwest Annex, must complete an annual proficiency qualification. There is no qualification required of shotgun hunters not utilizing slugs. Qualification dates and times will be announced during the first weeks of August and September in installation plans of the week (POW) and will also be posted at the NAS Oceana NRC, Building 78; WPNSTA Yorktown Hunt Station, Building 53; and Cheatham Annex MWR, Building 130. Standards are provided in enclosure (3).

d. Site-specific Hunting Procedures. Enclosures (4) through (17) detail specific procedures for hunting various types of game at COMNAVREG MIDLANT installations.

7. Enforcement. On bases covered herein, Navy regulations, and Federal, State, and local game laws are enforced by Natural Resources Management personnel acting as Station Conservation Officers by authority of the IC. They have the power to

apprehend and arrest all violators of Federal, State, and station game laws and regulations. In addition, they have the authority to dismiss any hunter in violation of this instruction or whomever they consider unsafe for any reason. All violations of this instruction or other applicable laws and regulations shall be reported to the Installation Natural Resources Manager or Security Officer.

8. Review Authority. The Regional Engineer's Natural Resources Program Manager is responsible for the reviewing and updating of this instruction.

G. E. EICHERT
Chief of Staff

Distribution: www.cnrma.navy.mil

STATION PERMIT SUSPENSION/REVOCATION

A-1 POLICY. The privilege of hunting on COMNAVREG MIDLANT installations is governed by the IC of the appropriate installation.

A-2 AUTHORITY. The Natural Resources Manager and Conservation Officer(s) shall enforce regulations and have the authority to suspend or revoke hunting privileges as appropriate.

A-3 VIOLATIONS. The following is a list of common violations and administrative actions that may be taken against personnel who violate applicable State and Federal hunting and trapping laws and regulations, and this instruction. Permit suspensions may be in addition to criminal prosecution and/or prosecution through the Uniform Code of Military Justice. Suspensions are measured in "hunting days from date of violation." Penalties for the second offense are indefinite revocation of hunting privileges. ICs have unlimited authority to control access to their installations and provide for the safety and security thereof. Penalties for the first offense are listed below:

VIOLATION	ACTION
Violation of parking requirements, or parking in an unauthorized area	10 Days
Guest not accompanied by sponsor	30 Days
Violation of blaze orange requirements	30 Days
Littering	30 Days
First violation of any station regulation, not a violation of State regulations	30 Days
Violation of station permit procedures	60 Days
Unauthorized stocking or release of domesticated or wild animals	60 Days
Violation of check-in or check-out procedures	TERMINATION FOR SEASON
Hunting on unauthorized days	TERMINATION FOR SEASON
Hunting in unauthorized areas or unauthorized movement into other hunting areas or stands	TERMINATION FOR SEASON
Second violation of any station regulation, not a violation of State regulations	1 Year
Violation of any State or Federal Wildlife Statute	PERMANENT HUNTING BAN
Use of unauthorized weapons or ammunition	PERMANENT HUNTING BAN

HUNTING APPLICATION

1. **SEASON - CHECK ONLY ONE BOX PER APPLICATION:**
(Applications with more than one box check will be discarded.)

SPRING TURKEY (Cheatham)	SPRING TURKEY (Yorktown)	GUN DEER (Cheatham)	BOW DEER (Cheatham)	GUN DEER (Yorktown)
Deadline: 15 MAR	15 MAR	1 NOV	15 SEP	1 NOV

2. **PREFERRED HUNTING DATE (List choices in priority order.):**

Date(s): _____
(Go to www.norfolk.navy.mil/pwc or call 887-7605 for available dates.)

3. **APPLICANT INFORMATION:**

NAME: _____

MIL ☐ OR CIV ☐ HUNTER SAFETY CARD NO. _____
(Check only one.) *(Attach photocopy with application.)*

COMMAND: _____

HOME MAILING ADDRESS: _____

_____

PHONE NUMBER: _____ (DAY) _____ (EVENING)

WPNSTA Yorktown PERMIT NUMBER: _____
(If obtained by date of application.)

4. **NAME OF GUEST (IF ANY) YOU WISH CONSIDERED ON THIS APPLICATION:**

NAME: _____ HUNTER SAFETY #: _____

5. **AGREEMENT:** By signing this application, I certify I have read, understand and will abide by COMNAVREGMIDLANTINST 11015.2 (Series) and all applicable State and Federal hunting laws. I consent to inspection at any time by duly authorized personnel (Navy, Federal, and State), for purposes of safety, security, or compliance with said instruction. Subject to penalties provided by law, I attest that I am not prohibited by Chapter 44 of title 18, U.S. Code, from possessing firearms or ammunition; and that the possession of firearms or ammunition will not violate a statute of the Commonwealth of Virginia or an ordinance applicable to the locality in which I reside. I attest that I have full knowledge of the risks and dangers involved in hunting and trapping, and hereby relieve the Federal Government of all liability for loss, damage, personal injury, or death sustained therein on board COMNAVREG MIDLANT installations. I agree that this release not only binds me, but also my family, heirs, assigns, administrators, and executors.

SIGNATURE: _____ **DATE:** _____

SIGNATURE: _____ **DATE:** _____ (Guest)

HUNTING APPLICATION INSTRUCTIONS

1. General. Print or type all required information except for signature. All information must be included. Applications must be mailed (or FAXED) and received at the following address by dates specified on the application. Late applications will not be considered unless available slots remain unfilled. **A photocopy of applicable military or Department of Defense (DOD) civilian identification, and hunter safety or IBEP card must be submitted with the application.**

For WPNSTA Yorktown or Cheatham Annex hunts:

Navy Public Works Center/Regional Engineer (Code 950)
9742 Maryland Avenue
Norfolk, VA 23511-3095

FAX: (757) 887-4478

2. Season. Check only one box per application. **If you wish to submit an application for more than one type of hunting, separate applications must be submitted.** Applications with more than one box checked in this section will be discarded.

3. Preferred Hunting Date. List preferred hunting dates. Available hunting dates may change for each calendar year based on State regulations and installation requirements. Go to **www.norfolk.navy.mil/pwc** for available dates or contact the Natural Resources Manager at WPNSTA Yorktown, (757) 887-7605.

4. Applicant Information. Print all information, including address and zip code. Ensure a block designating military or civilian is checked. List current station hunting permit number, if obtained.

5. Name of Guest. Eligible personnel may sponsor one guest while hunting deer or turkey. Guests must adhere to all application procedures, obtain an installation hunting permit and comply with all applicable qualifications. If an applicant is approved, the sponsored guest is also selected to hunt on that day. Include photocopy of guests hunter safety card.

6. Signature (Required). By signing page one of enclosure (2), applicants acknowledge they have read and understood this instruction and all applicable State and Federal hunting laws.

QUALIFICATION PROFICIENCY STANDARDS

1. BOWHUNTING

a. Archers shall be permitted up to three qualifying attempts per year. All attempts can be made on the same day if so desired.

b. Archers shall shoot two arrows each at three designated targets. Six arrows are required for any qualifying attempt. Qualification distances shall not exceed 25 yards.

c. On each target, one of two arrows must land inside a marked kill-zone. The shaft of an arrow breaking the line is a valid shot.

d. Arrows must be tipped with hunting broadheads, and equipment must be that to be used during the hunting season. All broadheads and shafts must match and be numbered with the last four digits of the archer's Social Security Number. Archers using mechanical broadheads can qualify with field points provided mechanical broadheads are presented at the qualification and used during the hunting season.

e. The bow hunting range shall be closed 30 minutes prior to all qualifications. No practice shots are allowed prior to the qualification period.

2. MUZZLELOADER/SHOTGUN SLUG

a. Participants shall be permitted one qualifying attempt per day. If more than one qualification shoot is scheduled for the year, shooters may attempt an additional qualification on the second day, within allotted range time, after all first time qualifiers have been given an initial attempt.

b. Participants may shoot up to three shots at the target from a bench rest distance of 50 yards. A 9" diameter target will have an internal 3½" diameter inner ring. Any shot inside the inner ring will be scored as 75 points and any in the outer ring will be scored as 50 points. Qualification consists of a minimum 125 point score. A shot breaking the edge of either ring is a valid shot.

c. Equipment used in qualifying shall be the same as that used for hunting.

d. No practice rounds permitted.

DEER HUNTING ON NAS OCEANA OR DAM NECK ANNEX

1. Season Dates/Hunting Hours. Unless specifically restricted by Natural Resources staff, seasons and hours will conform to those in reference (d). There shall be no hunting at NAS Oceana during, and two days prior to, the annual air show.

2. Area Closures. The Natural Resources Manager and/or the Security Officer may close specific areas at any time. Such announcements will be posted at NAS Oceana Security, Building 320 and at the Naval Resources Center (NRC), Building 78.

3. Indoctrination Brief. All persons wishing to hunt deer are required to attend an indoctrination brief given by the Natural Resources staff. This brief will help hunters familiarize themselves with hunting areas, base regulations, and all procedures not covered herein. These procedures are enforceable as indicated by enclosure (1). Dates for indoctrination will be posted at the NRC, Building 78, and in the NAS Oceana POW beginning in August.

4. Check-in Procedures

a. Each hunter shall sign-out at NAS Oceana Security, Building 320, for a specific area immediately before going into the field for hunting or scouting. Hunters may sign-out for an area as early as 1½ hours prior to sunrise. Hunters must report to the check station within 1½ hours after sunset of that hunting day or forfeit hunting privileges for the season. A hunter may not proceed to another hunting area without signing back-in and then back-out for the new area. Log forms must be completed at the end of each day's hunt. This includes information on hours hunted, game seen and harvested, and hunter identification.

b. Only one hunter shall be allowed in each hunting area for deer hunting unless a hunter is sponsoring a guest or hunters have prearranged with each other to hunt in the area. Hunters who plan to hunt in the same area must all be present at the time of check-in for an area.

c. Hunters shall be issued parking passes upon check-in for hunting areas. The parking pass must be displayed on the vehicle dashboard.

5. Permits/Application Process. No application other than purchase of the required State license and installation hunting permit is required.

6. Scouting

a. Scouting is permitted at any time during the year for individuals with a valid hunting permit. Scouting shall be

closed two weeks prior to the opening day of the regularly scheduled deer season, and may be closed at other times by the Natural Resources Manager or NAS Oceana Security Officer.

b. Individuals wishing to scout must report to NAS Oceana Security, Building 320, and check-out under the same procedures for hunting outlined above.

7. Handling of Harvested Game. Hunters may field-dress deer off station or in wooded areas where animals were harvested. No field-dressing is permitted within 200 yards of occupied buildings, roads, horse trails, agricultural areas, or within Airfield Clear Zone Boundaries.

8. Game Check-In. Per reference (d), a hunter harvesting a deer shall immediately attach the appropriate big game tag from their license or Deer Management Assistance Program (DMAP) tag to the animal before moving it from the place of kill. Successful hunters must contact the Natural Resource Manager (433-3461 or 433-2151 until 1600) to be issued a Virginia Department of Game and Inland Fisheries (VDGIF) Check Card and for collection of biological data from the animal. After 1600, the Natural Resources Manager may be contacted through NAS Oceana Security (433-3103). All check-in of deer will occur at the NAS Oceana NRC, Building 78.

DEER HUNTING ON NALF FENTRESS

1. Season Dates/Hunting Hours. Hunting at NALF Fentress is during the general Chesapeake firearms season unless otherwise designated by the Natural Resources Manager. Unless specifically restricted by Natural Resources staff, seasons and hours will conform to reference (d).

2. Area Closures. The Natural Resources Manager and/or Security Officer may close specific areas at any time. Such announcements will be posted at the Crash Captain's Watch Desk, Building 100, and the NAS Oceana NRC, Building 78.

3. Indoctrination Brief. All persons wishing to hunt deer are required to attend an indoctrination brief given by the Natural Resources staff. This brief will help hunters familiarize themselves with hunting areas, base regulations, and all procedures not covered herein. Dates for indoctrination will be posted at the NAS Oceana NRC, Building 78, NALF Fentress, Building 100, and in the NAS Oceana POW beginning in August.

4. Check-In Procedures. Hunters shall sign-out for a specific area as early as 1½ hours prior to sunrise at the Crash Captain's Watch Desk, NALF Fentress, Building 100, immediately before going into the field for hunting or scouting. Hunters must report to Building 100 within 1½ hours after sunset of that hunting day and complete a log form or forfeit hunting privileges for the season. A hunter may not proceed to another hunting area without signing back-in and then back-out for the new area.

5. Permits/Application Process. No application other than purchase of the required State license and installation hunting permit is required.

6. Scouting. Individuals wishing to scout must report to the Crash Captain, Building 100, and check-out for an area under the same procedures for hunting outlined above.

7. Handling of Harvested Game. Hunters may field-dress deer off station or in wooded areas where animals were harvested. No field-dressing is permitted within 200 yards of occupied buildings, roads, agricultural areas, or within Airfield Clear Zone Boundaries.

8. Game Check-In. Per reference (d), a hunter harvesting a deer shall immediately attach the appropriate big game tag from their license or DMAP tag to the animal before moving it from the place of kill. Successful hunter must contact the Natural Resource Manager (433-3461 or 433-2151 until 1600) to be issued a VDGIF Check Card and for collection of biological data from the animal. After 1600, the Natural Resources Manager may be contacted through NAS Oceana Security (433-3103). All check-in of deer will occur at the NAS Oceana NRC, Building 78.

DEER HUNTING ON WPNSTA YORKTOWN

1. Season Dates/Hunting Hours. Hunting is permitted only on Saturdays or specified Holidays that fall within the established Virginia hunting seasons, or on other dates within the established seasons as authorized by the Commanding Officer. The hunting day will be in accordance with reference (d), or as otherwise directed by the Natural Resources staff. A list of hunting days will be announced annually during the first week of August and September in the WPNSTA Yorktown POW and will also be posted at the WPNSTA Yorktown Hunt Station, Building 53, and Cheatham Annex MWR, Building 130.

2. Area Closures. The Natural Resources Manager and/or the Security Officer may close specific stands or areas at any time. Such announcements will be made during the Indoctrination Brief.

3. Indoctrination Brief. On the morning of the hunt, all hunters must first check-in by 0500 with the Natural Resources personnel at the WPNSTA Yorktown Hunt Station, Building 53, before proceeding to their assigned hunt area. Hunters will be given an indoctrination brief, assigned a marked stand, and taken to their assigned hunting stand by a designated Hunt Captain.

4. Check-In Procedures. Hunters shall remain within their assigned area. No hunter will be permitted to leave the stand unless the Hunt Captain is with them, except to return to the drop-off point, and/or collect and field-dress harvested game. No hunter shall solicit or accept a ride back to the Hunt Station by any individual other than their Hunt Captain. During the early archery season, all bowhunters will assemble at the WPNSTA Yorktown Hunt Station where they are scheduled to hunt at a time directed by the Natural Resources staff.

5. Permits/Application Process. In addition to the State license and installation permit, anyone wishing to hunt at WPNSTA Yorktown shall fill-out enclosure (2) and submit by stated application deadlines and according to directions. A drawing to select participants for each hunt will be held and successful applicants notified. In the event that all hunting spaces are not filled, the Natural Resources Manager may accept late applications.

6. Scouting. There is no scouting permitted on WPNSTA Yorktown.

7. Handling of Harvested Game. Hunters may retrieve and field-dress any deer taken within direct line-of-sight of their assigned stand. If a wounded animal leaves direct line-of-sight, the hunter should wait for arrival of a designated Hunt Captain before pursuing.

8. Game Check-In. Upon return from the hunting area, all hunters shall check-in at the Hunt Station, Building 53. Successful hunters will then report kills and exchange their license tab for an official VDGIF Check Card.

DEER HUNTING ON CHEATHAM ANNEX

1. Season Dates/Hunting Hours. Hunting is permitted on Wednesday beginning at 1200 and on Saturdays, or specified Holidays that fall within the established Virginia hunting seasons, or on other dates within the established seasons as authorized by Commanding Officer, WPNSTA Yorktown. The hunting hours will be in accordance with reference (d), or as otherwise directed by the Natural Resources staff. A list of hunting days will be announced annually during the first week of August and September in the WPNSTA Yorktown POW and will also be posted at the WPNSTA Yorktown Hunt Station, Building 53, and Cheatham Annex MWR, Building 130.

2. Area Closures. The Natural Resources Manager and/or the Security Officer may close specific stands or areas at any time. Adjustments to hunting days/hours may be made by the Natural Resources Manager as required. Such announcements will be made during the indoctrination brief.

3. Indoctrination Brief. Selected hunters shall assemble at a location specified by the Natural Resources Staff by 1130 Wednesdays or by 0430 on Saturdays on their scheduled hunt day. Hunters will be given an indoctrination brief, and be assigned a hunting area. Hunters will be issued a parking pass and map of their assigned hunt area showing the boundaries and the designated parking area, and at that point, may proceed to the field.

4. Check-In Procedures

a. Hunters shall remain within their assigned area. Hunters must check out in person at the conclusion of their hunt, no later than 1½ hours after sunset of that hunting day or as otherwise directed by the Natural Resources staff, or forfeit hunting privileges for the season. A hunter may not proceed to another hunting area without clearance from the Natural Resources staff. Temporary tree stands shall be removed from the woods at the conclusion of each hunt day.

b. Only one hunter will be allowed in each hunting area, except that individuals under 16 years of age may occupy the same area as their sponsor, but only one bow or gun will be allowed in each area.

5. Permits/Application Process. In addition to the State license and installation permit, anyone wishing to hunt at Cheatham Annex shall fill out enclosure (2) and submit by deadline dates, according to directions. A drawing to select participants for each hunt will be held and successful applicants notified. In the event not all hunting spaces are filled, the Natural Resources Manager may accept late applications.

6. Scouting. Scouting will be permitted in advance of the early archery season by contacting the WPNSTA Yorktown, Security Officer.

7. Handling of Harvested Game. All deer shall be field-dressed in the wooded area where the animal was harvested. Hunters may not pursue wounded animals beyond the boundaries of their assigned hunt area without permission from the Natural Resources staff.

8. Game Check-In. Per reference (d), a hunter harvesting a deer shall immediately attach the appropriate big game tag from his or her license or DMAP tag to the animal before moving it from the place of kill. All deer harvested must be checked in, at which time hunters will exchange their license tab for an official VDGIF Check Card.

DEER HUNTING ON NAVSUPPACT NORFOLK, NORTHWEST ANNEX

1. Season Dates/Hunting Hours. Hunting at NAVSUPPACT Norfolk, Northwest Annex is on Tuesdays, Thursdays, and Saturdays during the general Chesapeake or Currituck County firearms season unless otherwise designated by the Natural Resources Manager. Unless specifically restricted by Natural Resources staff, seasons and hours will conform to those listed in references (d) and (e).

2. Area Closures. The Natural Resources Manager and/or the Security Officer may close specific stands or areas at any time. Such announcements will be made during the indoctrination brief. MWR is responsible for notifying Natural Resources personnel and the Security Officer one week prior to scheduling use of campground areas.

3. Indoctrination Brief. All persons wishing to hunt deer are required to attend an indoctrination brief given by the Natural Resources staff. This brief will help hunters familiarize themselves with hunting areas, base regulations, and all procedures not covered in this instruction. Dates for indoctrination will be posted at the NAS Oceana NRC, Building 78, Northwest Annex, Building 404, and in the Northwest Annex POW beginning in August.

4. Check-In Procedures. Hunters shall sign-out for a specific area as early as 1½ hours prior to sunrise at Building 145, Northwest Annex, Security immediately before going into the field for hunting or scouting. Hunters must report to Building 145 within 1½ hours after sunset of that hunting day and complete a log form, or forfeit hunting privileges for the season. A hunter may not proceed to another hunting area without signing back-in and then back-out for the new area.

5. Permits/Application Process. No application other than purchase of the required State license and installation hunting permit is required.

6. Scouting. Individuals wishing to scout must report to Building 145, Security Office, and check-out for an area under the same procedures for hunting outlined above.

7. Handling of Harvested Game. Hunters may field-dress deer off station or in wooded areas where animals were harvested.

8. Game Check-In. Per references (d) and (e), a hunter harvesting a deer shall immediately attach the appropriate big game tag from their license or DMAP tag to the animal before moving it from the place of kill. Successful hunters must contact the Natural Resource Manager (421-8043 until 1600) to be issued a VDGIF Check Card and for collection of biological data from the animal. After 1600, the Natural Resources Manager may be contacted through Northwest Annex, Security (421-8000). All check-in of deer will occur at the game check station, Building 295.

WATERFOWL HUNTING ON DAM NECK ANNEX

1. Season Dates/Hunting Hours. Waterfowl seasons will be in accordance with all State and/or Federal seasons. All Federal bag limits and other migratory waterfowl regulations apply.

2. Blinds/Area Closures. Waterfowl hunters will be allowed to hunt only from duck blind locations maintained by the Natural Resources Manager. Blind locations will be posted at NAS Oceana, Security, Building 320, and the NRC, Building 78. Hunters may not hunt from shore, boats, or any area other than authorized blind locations. The Natural Resources Manager and/or the Security Officer may close specific blinds at any time. Such announcements will be posted at the Security Office, Building 320.

3. Check-in Procedures. Blinds will be drawn on a first-come basis on the opening day of each split season and the following Wednesdays and Saturdays during the season. Blind reservations shall not be accepted. Waterfowl hunters must check-out blinds at NAS Oceana, Security, Building 320, on the day they are hunting no earlier than 1½ hours before sunrise. Hunters must check-in with Security no later than one hour after sunset.

4. Permits/Application Process. All waterfowl hunters must have a Federal migratory duck stamp and Harvest Information Program (HIP) number in addition to their State hunting license and station permit.

5. Game Check-In. Upon return from the hunting area, all hunters shall check-in at the Security Office to turn in parking passes and report harvest information.

6. Restrictions. Boats used for waterfowling may be propelled by gasoline engines in Redwing Lake only; however, "no wake" limitations will be strictly enforced. Boats are not permitted on Lake Tecumseh unless written permission is obtained from the private landowner. For boating and personal safety, no more than four hunters are permitted to hunt from a duck blind.

SPRING TURKEY (GOBBLER) SEASON ON WPNSTA YORKTOWN

1. Season Dates/Hunting hours. Hunting is permitted on WPNSTA Yorktown on Saturdays during the established Virginia Spring Hunting Season for bearded birds only. All Virginia bag limits and regulations apply. The hunting day will be from 30 minutes before sunrise until 1200.

2. Indoctrination Brief. Selected hunters are to assemble at the Hunt Station, Building 53, on their scheduled hunt day at a time directed by the Natural Resources Manager. Hunters will be briefed and assigned a hunting area prior to going into the field.

3. Permits/Application Process. Due to security concerns, turkey hunting at WPNSTA Yorktown is restricted to Yorktown personnel only. There are a limited number of spaces available on each hunting day. Yorktown personnel wishing to hunt turkey at WPNSTA Yorktown shall fill-out enclosure (2) and submit according to directions. A drawing to select participants for each hunt will be held and successful applicants notified. A State license and installation permit is also required.

4. Game Check-In. Upon return from the hunting area, all hunters shall check-in at the Hunt Station, Building 53. Successful hunters will then report kills and exchange their license tab for an official VDGIF Check Card.

5. Restrictions. Electric callers are prohibited, as are dogs and organized drives.

SPRING TURKEY (GOBBLER) SEASON ON CHEATHAM ANNEX

1. Season Dates/Hunting hours. Hunting is permitted on Cheatham Annex on Wednesdays and Saturdays during the established Virginia Spring Hunting Season for bearded birds only. All Virginia bag limits and regulations apply. The hunting day will be from 30 minutes before sunrise until 1200.

2. Indoctrination Brief. Selected hunters shall assemble at the WPNSTA Yorktown Hunt Station, Building 53, on their scheduled hunt day at a time directed by the Natural Resources staff. Hunters will be given an indoctrination brief, and be assigned a hunt area. Hunters will be issued a parking pass and map of their assigned hunt area showing the boundaries, and at that point, may proceed to Cheatham Annex.

3. Permits/Application Process. There are a limited number of spaces available on each hunting day. Anyone wishing to hunt turkey at Cheatham Annex shall fill out and submit enclosure (2). Drawings to select participants for each hunt will be held and successful applicants notified. A State license and installation permit is also required.

4. Game Check-In. Hunters must remain within their assigned area. Hunters must check-out in person at the conclusion of their hunt, no later than 1230 or as directed by the Natural Resources staff, or forfeit hunting privileges for the season. A hunter may not proceed to another hunting area without clearance from the Natural Resources staff.

5. Restrictions. Electric callers are prohibited, as are dogs and organized drives.

6. Scouting. Scouting will be permitted in advance of the spring gobbler season by contacting the Cheatham Annex, Security Department.

SMALL GAME HUNTING ON NAS OCEANA

1. Season Dates/Hunting Hours. The small game season includes squirrel, rabbit, quail, dove, woodcock, and other species as authorized by Virginia game regulations. Virginia regulations regarding bag limits, seasons, and hours will be followed.

2. Area Closures. Except for dove hunting, small game areas will be open on Saturdays only during the regular small game season. While open to small game hunting, all deer hunting areas within the small game area will be closed. Open small game hunting areas will be posted at NAS Oceana, Security, Building 320, and the NRC, Building 78. The Natural Resources Manager and/or Security Officer may close specific areas at any time. Such announcements will be posted at NAS Oceana, Security, Building 320, and outside the NRC, Building 78.

3. Indoctrination Brief. Although an indoctrination brief is not required for small game hunters, all hunters should be familiar with hunting area boundaries and parking areas prior to hunting.

4. Check-In Procedures. Each hunter shall sign-out at Security, Building 320, for a specific area immediately before going into the field for hunting. Hunters may sign-out for an area as early as sunrise. Only one hunting party, consisting of up to four hunters, shall be allowed in a small game hunting area at any one time. To reduce pressure on game species, only two hunting parties shall be allowed in any small game area per day. Reservation of hunting areas shall not be accepted. Hunters shall be issued parking maps and parking passes upon check-in for hunting areas. The parking pass must be displayed on the vehicle dashboard. Upon return from the hunting area, all hunters shall check-in at the Security Office by sunset of that hunting day, complete the log form, and turn in parking passes.

5. Permits/Application Process. No application other than purchase of the required State license and installation hunting permit.

SMALL GAME HUNTING ON NALF FENTRESS

1. Season Dates/Hunting Hours. The small game season includes squirrel, rabbit, quail, dove, woodcock, and other species as authorized by Virginia game regulations. Virginia regulations regarding bag limits and seasons will be followed.

2. Area Closures. Small game areas will be open only after the general Chesapeake firearm season for deer is over. Except for dove hunting, hunting is permitted on Saturdays only during the regular small game season. The Natural Resources Manager and/or Security Officer may close specific areas at any time. Such announcements will be posted at the Crash Captain's Watch Desk, Building 320. These announcements will also be posted outside the NRC, Building 78.

3. Indoctrination Brief. An indoctrination brief is not required for small game hunters although all hunters should be familiar with hunting area boundaries and parking areas.

4. Check-In Procedures. Each hunter shall sign-out at the Crash Captain's Watch Desk, Building 100, for a specific area immediately before going into the field for hunting. Hunters may sign-out for an area as early as sunrise. To reduce pressure on game species, only one hunting party, consisting of up to four hunters, shall be allowed in a small game hunting area per day. Reservation of hunting areas shall not be accepted. Hunters shall be issued parking maps and parking passes upon check-out of a hunting area. The parking pass must be displayed on the vehicle dashboard. Hunters may only hunt in the area in which they have signed-out. Prior to hunting in another area, hunters are required to report back to the Crash Captain, Building 100, and turn-in hunting and parking passes. Hunters must report to Building 100 by sunset of that hunting day or forfeit hunting privileges for the season. Log forms must be completed at the end of each day's hunt. This includes information on hours hunted, game seen and harvested, and hunter identification.

5. Application Process. No application other than purchase of the required State license and installation hunting permit.

SMALL GAME HUNTING ON NAVSUPPACT NORFOLK, NORTHWEST ANNEX

1. Season Dates/Hunting Hours. The small game season includes rabbit, quail, dove, woodcock, and other species as authorized by Virginia or North Carolina game regulations. Virginia and/or North Carolina regulations regarding bag limits and seasons will be followed.

2. Area Closures. Small game areas will be open only on Saturdays after the general Chesapeake and Currituck firearm seasons for deer are over. Except for dove hunting, hunting is permitted on Saturdays only during the regular small game season. The Natural Resources Manager and/or Security Officer may close specific areas at any time. Such announcements will be posted at Building 145, Security, and outside the NAVSUPPACT Norfolk, Northwest Annex, Environmental Office, Building 404.

3. Indoctrination Brief. An indoctrination brief is not required for small game hunters although all hunters should be familiar with hunting area boundaries and parking areas.

4. Check-In Procedures. Each hunter shall sign-out at Building 145, Security, for a specific area immediately before going into the field for hunting. Hunters may sign-out for an area as early as sunrise. To reduce pressure on game species, only one hunting party, consisting of up to four hunters, shall be allowed in a small game hunting area per day. Reservation of hunting areas shall not be accepted. Hunters shall be issued parking maps and parking passes upon check-out of a hunting area. The parking pass must be displayed on the vehicle dashboard. Hunters may only hunt in the area in which they have signed-out. Prior to hunting in another area, hunters are required to report back to Building 145, Security, and turn in hunting and parking passes. Hunters must report to Building 145 by sunset of that hunting day or forfeit hunting privileges for the season. Log forms must be completed at the end of each day's hunt. This includes information on hours hunted, game seen and harvested, and hunter identification.

5. Application Process. No application other than purchase of the required State license and installation hunting permit.

SMALL GAME HUNTING ON WPNSTA YORKTOWN

1. Season Dates/Hunting Hours. Hunting is permitted only on Saturdays or specified Holidays prior to and immediately after the general firearms season for deer, which fall within the established Virginia hunting seasons, or on other dates within the established seasons as authorized by the Commanding Officer.

The hunting day will be in accordance with reference (d), or as otherwise directed by the Natural Resources staff. The small game season includes squirrel, rabbit, quail, dove, woodcock, and other species as authorized by Virginia game regulations. Virginia regulations regarding bag limits and seasons will be followed. While dove hunting is permitted on scheduled small game hunt days on WPNSTA Yorktown during the regular dove season, organized hunts are not planned.

2. Area Closures. The Natural Resources Manager will determine open areas.

3. Indoctrination Brief. Small game hunters are to assemble at the Hunt Station, Building 53, of the WPNSTA Yorktown unit on scheduled hunting days at a time directed by the Natural Resources Manager. Hunters will be briefed and assigned a hunting area prior to going into the field.

4. Check-in Procedures. Hunters are to assemble at the Hunt Station at the WPNSTA Yorktown unit where they will be briefed and assigned an area in which to hunt.

5. Application Process. No application, other than purchase of the required State license and installation hunting permit, is required. All hunters planning to hunt doves or woodcock must have a HIP number in addition to their State hunting license and station permit.

6. Game Check-In. All hunters will check back in at the Hunt Station before leaving for the day.

DOVE HUNTING ON NAS OCEANA, NALF FENTRESS, AND NAVSUPPACT NORFOLK, NORTHWEST ANNEX

1. Season Dates/Hunting Hours. Dove may be hunted on NAS Oceana, NALF Fentress, and NAVSUPPACT Norfolk, Northwest Annex on Tuesdays, Thursdays, Saturdays, and designated Holidays during the open seasons. Bag limits, seasons, and times are subject to annual change.

2. Area Closures. Availability of open fields is dependent on various factors including weather, crop type, and maturity. The Natural Resources Manager will be responsible for determining field availability and rotation schedule. Dove field locations change from year to year. For NAS Oceana, locations shall be posted at Security, Building 320, and the NRC, Building 78. For NALF Fentress, locations shall be posted at the Crash Captain's Watch Desk, Building 100. For NAVSUPPACT Norfolk, Northwest Annex, locations will be posted at Buildings 145 and 404. Hunter quotas may be assigned to each area for dove hunting. These quotas shall be posted, if applicable, at the Hunter Check Station.

3. Indoctrination Brief. An indoctrination brief is not required for small game hunters although all hunters should be familiar with hunting area boundaries and parking areas.

4. Check-in Procedures. Due to high response for opening day of the season, all NAS Oceana check-in for that day will be conducted at the NRC, Building 78. Hunter quotas and areas will be assigned at this time. Hunting check-in after that day will be at Building 320. NALF Fentress hunters will check-in at Building 100, and NAVSUPPACT Norfolk, Northwest Annex hunters will check-in at Building 145. Upon return from the hunting area, all hunters shall check-in at the Security Office or the Crash Captain's Watch Desk, NALF Fentress to turn in parking passes and report harvest.

5. Permit/Application Process. All dove hunters must have a HIP number in addition to their State hunting license and station permit.

TRAPPING AT NAS OCEANA, NALF FENTRESS, DAM NECK, OR NAVSUPPACT NORFOLK, NORTHWEST ANNEX

1. Season Dates/Hunting Hours. Trappers must abide by State laws, this instruction, and any other special regulation announced by the Natural Resources Manager.

2. Area Closures. The Natural Resources Manager will designate trapping areas and, in coordination with the Security Officer, may restrict access to these areas.

3. Check-In Procedures. Prior to checking traps, trappers must check-in at the Security Watch Desk, Building 320, NAS Oceana, Building 551, Dam Neck Annex, or Crash Captain's Watch Desk, Building 100, NALF Fentress.

4. Permit/Application Process. Any person wishing to trap furbearers must register and submit a request for area assignment with the NAS Oceana Natural Resources Manager. Trappers may request trapping areas on or after 1 October of each year. Drawings for trapping areas shall be held when it is anticipated that the demand for areas exceeds quotas.

5. Restrictions

a. A nonferrous metal tag bearing the trapper's name and address must be attached to each trap. Traps not marked risk confiscation by the Conservation Officer or Natural Resources Manager.

b. Traps must be checked at least daily.

c. No steel trap or snare shall be set within 200 yards of a residence or within a designated Special Services area, such as the picnic area or Boy Scout camping area.

d. The use of body-gripping traps with a jawspread in excess of 7½" is prohibited except when such traps are completely covered by water.

e. It is prohibited to set above the ground any steel trap with teeth set upon the jaws or with a jaw spread exceeding 6½", or any body-gripping trap with a jaw spread in excess of 5", baited with any lure or scent likely to attract a dog.

f. No trap or snare may be set in hunting areas on days that rabbit, quail, or dove are hunted unless traps remain covered by at least 6" of water at all times.

g. Dens or houses of furbearers may not be disturbed.

h. Trappers must report weekly catch in writing during the season to the Natural Resources Manager. Trappers should provide information on sex, weight, and condition for each animal taken.

i. Animal carcasses shall be disposed of off station. Any trapper caught disposing of carcasses on station shall lose all trapping privileges.

APPENDIX C

Station Species Lists

Enclosure 1 WPNSTA/CAX Fish
Enclosure 2 WPNSTA/CAX Herpetofauna
Enclosure 3 WPNSTA/CAX Birds
Enclosure 4 WPNSTA/CAX Mammals
Enclosure 5 WPNSTA/CAX Flora

Fishes Common to WPNSTA/CAX

Scientific Name	Common Name	Origin[1]
WPNSTA		
Alosa aestivalis	Blueback herring	N
Alosa pseudoharengus	Alewife	N
Alosa sapidissima	American shad	I/N
Anchoa mitchilli	Bay anchovy	N
Anguilla rostrata	American eel	N
Bairdiella chrysoura	Silver perch	N
Balistes capriscus	Gray triggerfish	N
Brevoortia tyrannus	Atlantic menhaden	N
Centropristes striata	Black sea bass	N
Cynoscion nebulosus	Spotted sea trout	N
Cynoscion regalis	Weakfish	N
Dorosoma cepedianum	Gizzard shad	N
Enneacanthus gloriosus	Bluespotted sunfish	N
Fundulus diaphanus	Banded killifish	N
Fundulus heteroclitus	Mummichog	N
Ictalurus punctatus	Channel catfish	I
Lepomis gibbosus	Pumpkinseed	I
Lepomis macrochirus	Bluegill	I
Lieostomus xanthurus	Spot	N
Membras martinica	Rough silverside	N
Menidia beryllina	Inland silverside	N
Menidia menidia	Atlantic silverside	N
Menticirrhus spp.	Kingfish	N
Micropongonias undulatus	Atlantic croaker	N
Micropterus salmoides	Largemouth bass	I
Morone americana	White perch	N
Morone saxatillis	Striped bass	I
Opsanus tau	Oyster toadfish	N
Orthopristis chrysoptera	Pigfish	N
Paralichthys dentatus	Summer flounder	N
Pleuronectes americanus	Winter flounder	N
Pomatomus saltatrix	Bluefish	N
Scomberomorus maculatus	Spanish mackerel	N
Sphoeroides maculatus	Northern puffer	N
Stenotomus chrysops	Scup	N
Tautoga onitis	Tautog	N
Trinectes maculatus	Hogchoker	N
Umbra limi	Mudminnow	I

Fishes Common to WPNSTA/CAX (continued)

Scientific Name	Common Name	Origin[1]
CAX		
Anguilla rostrata	American eel	N
Dorosoma cepedianum	Gizzard shad	N
Dorosoma pentenense	Threadfin shad	I
Ictalurus punctatus	Channel catfish	I
Lepomis macrochirus	Bluegill	I
Lepomis microlophus	Redear sunfish	I
Membras martinica	Rough silverside	N
Menidia beryllina	Inland silverside	N
Menidia menidia	Atlantic silverside	N
Micropterus salmoides	Largemouth bass	N
Pomoxis nigromaculatus	Black crappie	N

[1]N = Native, I = Introduced

Sources: Swihart and Daniel 1994, Galvez and Swihart 1999, USFWS 2002, Fuller et al. 1999, EPA 2002

Herpetofauna of WPNSTA/CAX

Scientific Name	Common Name
Amphibians	
Salamanders	
Ambystoma mabeei	Mabee's salamander
Ambystoma maculatum	spotted salamander
Ambystoma opacum	marbled salamander
Hemidactylium scutatum	four-toed salamander
Notophthalmus viridescens viridescen	red-spotted newt
Plethodon cinereus	eastern red-backed salamander
Plethodon glutinosus	northern slimy salamander
Frogs and Toads	
Acris crepitans crepitans	eastern cricket frog
Anaxyrus americanus americanus	eastern American toad
Anaxyrus fowleri	Fowler's toad
Gastrophryne carolinensis	eastern narrow-mouthed toad
Hyla chrysoscelis	Cope's gray treefrog
Hyla cinerea	green treefrog
Lithobates catesbeianus	American bullfrog
Lithobates clamitans melanota	northern green frog
Lithobates palustris	pickerel frog
Lithobates sphenocephalus utricularius	southern leopard frog
Pseudacris crucifer crucifer	northern spring peeper
Pseudacris feriarum feriarum	upland chorus frog
Scaphiopus holbrookii	spadefoot toad
Reptiles	
Turtles	
Chelydra serpentina serpentina	eastern snapping turtle
Chrysemys picta	painted turtle
Clemmys guttata	spotted turtle
Kinosternon subrubrum subrubrum	eastern mud turtle
Psudemys rubriventris	northern red-bellied turtle
Sternotherus odoratus	musk turtle (stinkpot)
Terrapene carolina carolina	eastern box turtle
Trachemys scripta elegans	red-eared slider
Trachemys scripta scripta	yellow-bellied slider

Herpetofauna of WPNSTA/CAX (continued)

Scientific Name	Common Name
Snakes	
Agkistrodon contortix	copperhead
Thamnophis sauritus	eastern ribbon snake
Carphophis amoenus amoenus	eastern worm snake
Coluber constrictor constrictor	northern black racer
Cemophora coccinea	scarlet snake
Diadophis punctatus	ring-necked snake
Elaphe obsoleta	black rat snake
Heterodon platyrhinos	eastern hognose snake
Nerodia sipedon sipedon	northern water snake
Opheodrys aestivus	rough green snake
Virginia striatula	rough earth snake
Virginia valeriae	smooth earth snake
Lizards	
Plestidon fasciatus	common five-lined skink
Eumeces laticeps	broad-headed skink
Sceloporus undulatus	fence lizard
Scincella lateralis	little brown skink

Source: Buhlmann et al. 1990; Buhlmann and Ludwig 1992; Wilson 2003; Tetra Tech, Inc. 2009; NAVFAC 2009.

Birds Observed at WPNSTA/CAX

Order	Common Name
Podicipediformes	
Gavia immer	Common Loon
Podilymbus podiceps	Pied-billed Grebe
Pelecaniformes	
Pelecanus occidentalis	Brown Pelican
Phalacrocorax auritus	Double-crested Cormorant
Phalacrocorax carbo	Great Cormorant
Ciconiiformes	
Ardea herodias	Great Blue Heron
Ardea alba	Great Egret
Butorides virescens	Green Heron
Anseriformes	
Anas americana	American Wigeon
Anas discors	Blue-winged Teal
Bucephala albeola	Bufflehead
Branta canadensis	Canada Goose
Bucephala clangula	Common Goldeneye
Anas strepera	Gadwall
Lophodytes cucullatus	Hooded Merganser
Aythya affinis	Lesser Scaup
Anas platyrhynchos	Mallard
Cygnus olor	Mute Swan
Aythya collaris	Ring-necked Duck
Oxyura jamaicensis	Ruddy Duck
Aix sponsa	Wood Duck
Cygnus columbianus	Tundra Swan
Falconiformes	
Falco sparverius	American Kestrel
Haliaeetus leucocephalus	Bald Eagle
Coragyps atratus	Black Vulture
Buteo platypterus	Broad-winged Hawk
Accipiter cooperii	Cooper’s Hawk
Pandion haliaetus	Osprey
Buteo jamaicensis	Red-tailed Hawk
Buteo lineatus	Red-shouldered Hawk
Cathartes aura	Turkey Vulture
Charadriiformes	
Scolopax minor	American Woodcock
Rynchops niger	Black Skimmer
Sterna hirundo	Common tern

Birds Observed at WPNSTA/CAX (continued)

Order	Common Name
Charadriiformes (continued)	
Sterna forsteri	Forster's Tern
Larus marinus	Great black-backed Gull
Larus argentatus	Herring Gull
Charadrius vociferus	Killdeer
Sterna forsteri	Laughing Gull
Erolia minutilla	Least Sandpiper
Sterna antillarum	Least Tern
Larus delawarensis	Ring-billed Gull
Thalasseus maximus	Royal Tern
Actitis macularia	Spotted Sandpiper
Columbiformes	
Zenaida macroura	Mourning Dove
Columba livia	Rock Pigeon
Cuculiformes	
Coccyzus americanus	Yellow-billed Cuckoo
Galliformes	
Colinus virginianus	Northern Bobwhite
Meleagris gallopavo	Wild Turkey
Strigiformes	
Strix varia	Barred Owl
Bubo virginianus	Great Horned Owl
Megascops asio	Eastern Screech Owl
Caprimulgiformes	
Caprimulgus carolinensis	Chuck-will’s-widow
Chordeiles minor	Common Nighthawk
Apodiformes	
Archilochus colubris	Ruby-throated Hummingbird
Coraciiformes	
Megaceryle alcyon	Belted Kingfisher
Piciformes	
Picoides pubescens	Downy Woodpecker
Picoides villosus	Hairy Woodpecker
Colaptes auratus	Northern Flicker
Dryocopus pileatus	Pileated Woodpecker
Melanerpes carolinus	Red-bellied Woodpecker
Melanerpes erythrocephalus	Red-headed Woodpecker
Sphyrapicus varius	Yellow-bellied Sapsucker
Passeriformes	
Empidonax virescens	Acadian Flycatcher
Corvus brachyrhynchos	American Crow

Birds Observed at WPNSTA/CAX (continued)

Order	Common Name
Passeriformes (continued)	
Carduelis tristis	American Goldfinch
Setophaga ruticilla	American Redstart
Turdus migratorius	American Robin
Icterus galbula	Baltimore Oriole
Hirundo rustica)	Barn Swallow
Dendroica fusca	Blackburnian Warbler
Poecile atricapillus	Black-capped Chickadee
Mniotilta varia	Black-and-white Warbler
Dendroica striata	Blackpoll Warbler
Dendroica caerulescens	Black-throated Blue Warbler
Passerina caerulea	Blue Grosbeak
Cyanocitta cristata	Blue Jay
Polioptila caerulea	Blue-gray Gnatcatcher
Vermivora pinus	Blue-winged Warbler
Certhia americana	Brown Creeper
Toxostoma rufum	Brown Thrasher
Molothrus ater	Brown-headed Cowbird
Sitta pusilla	Brown-headed Nuthatch
Poecile carolinensis	Carolina Chickadee
Thryothorus ludovicianus	Carolina Wren
Bombycilla cedrorum	Cedar Waxwing
Dendroica pensylvanica	Chestnut-sided Warbler
Spizella passerina	Chipping Sparrow
Quiscalus quiscula	Common Grackle
Geothlypis trichas	Common Yellowthroat
Sialia sialis	Eastern Bluebird
Tyrannus tyrannus	Eastern Kingbird
Sturnella magna	Eastern Meadowlark
Sayornis phoebe	Eastern Phoebe
Pipilo erythrophthalmus	Eastern Towhee
Contopus virens	Eastern Wood-pewee
Sturnus vulgaris	European Starling
Spizella pusilla	Field Sparrow
Corvus ossifragus	Fish Crow
Regulus satrapa	Golden-crowned Kinglet
Dumetella carolinensis	Gray Catbird
Myiarchus crinitus	Great Crested Flycatcher
Catharus guttatus	Hermit Thrush
Wilsonia citrina	Hooded Warbler
Carpodacus mexicanus	House Finch

Birds Observed at WPNSTA/CAX (continued)

Order	Common Name
Passeriformes (continued)	
Passer domesticus	House Sparrow
Troglodytes aedon	House Wren
Passerina cyanea	Indigo Bunting
Oporornis formosus	Kentucky Warbler
Empidonax minimus	Least Flycatcher
Seiurus motacilla	Louisiana Waterthrush
Dendroica magnolia	Magnolia Warbler
Cistothorus palustris	Marsh Wren
Colinus virginianus	Northern Bobwhite
Cardinalis cardinalis	Northern Cardinal
Mimus polyglottos	Northern Mockingbird
Parula americana	Northern Parula
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Icterus spurius	Orchard Oriole
Seiurus aurocapillus	Ovenbird
Dendroica palmarum	Palm Warbler
Dendroica pinus	Pine Warbler
Dendroica discolor	Prairie Warbler
Protonotaria citrea	Prothonotary Warbler
Progne subis	Purple Martin
Vireo olivaceus	Red-eyed Vireo
Agelaius phoeniceus	Red-winged Blackbird
Regulus calendula	Ruby-crowned Kinglet
Euphagus carolinus	Rusty Blackbird
Passerculus sandwichensis	Savannah Sparrow
Piranga olivacea	Scarlet Tanager
Junco hyemalis	Slate-colored Junco
Melospiza melodia	Song Sparrow
Piranga rubra	Summer Tanager
Catharus ustulatus	Swainson’s Thrush
Tachycineta bicolor	Tree Swallow
Baeolophus bicolor	Tufted Titmouse
Catharus fuscescens	Veery
Troglodytes troglodytes	Winter Wren
Sitta carolinensis	White-breasted Nuthatch
Vireo griseus	White-eyed Vireo

Birds Observed at WPNSTA/CAX (continued)

Order	Common Name
Passeriformes (continued)	
Zonotrichia albicollis	White-throated Sparrow
Hylocichla mustelina	Wood Thrush
Helmitheros vermivorus	Worm-eating Warbler
Dendroica petechia	Yellow Warbler
Icteria virens	Yellow-breasted Chat
Dendroica coronata	Yellow-rumped Warbler
Vireo flavifrons	Yellow-throated Vireo
Dendroica dominica	Yellow-throated Warbler

Sources: Buhlmann et al. 1990; Buhlmann and Ludwig 1992; GMI 2002; Tetra Tech, Inc 2009.

Mammals Known to Occur at WPNSTA/CAX

Scientific Name	Common Name
Marsupials	
Didelphis virginianus	Virginia opossum
Insectivores	
Blarina carolinensis	short-tailed shrew
Cryptotis parva	least shrew
Eptesicus fuscus	big brown bat
Sorex hoyi	pygmy shrew
Sorex longirostris longirostris	southeastern shrew
Scalopus aquaticus	eastern mole
Rodents	
Castor canadensis	beaver
Glaucomys volans	southern flying squirrel
Marmota monax	groundhog
Microtus pennsylvanicus	meadow vole
Microtus pinetorum	pine vole
Mus musculus	house mouse
Ondatra zibethica	muskrat
Oryzomys palustris	rice rat
Peromyscus leucopus	white-footed mouse
Rattus norvegicus	Norway rat
Reithrodontomys humulus	harvest mouse
Sciurius carolinensis	eastern gray squirrel
Tamiasciurus hudsonicus	red squirrel
Lagomorphs	
Sylvilagus floridana	eastern cottontail rabbit
Carnivores	
Canis latrans	eastern coyote
Lynx rufus	bobcat
Procyon lotor	raccoon
Urocyon cinereoargenteus	gray fox
Ursus americanus	black bear
Vulpes vulpes	red fox
Ungulates	
Odocoileus virginiana	white-tailed deer

Source: Buhlmann et al. 1990; Buhlmann and Ludwig 1992; Wilson 2003; Tetra Tech, Inc. 2009.

Yorktown Naval Weapons Station
Flora of WPNSTA & CAX

Scientific Name	Common Name	Area
Herbaceous		
Acalypha gracilens	three-seeded mercury	CAX
Achillea millefolium	yarrow	CAX
Adiantum pedatum	maidenhair fern	CAX
Agalinis maritima	salt-marsh false foxglove	WPNSTA
Agalinis purpurea	false foxglove	CAX
Ageratina altissima var. altissima	white snakeroot	WPNSTA
Agrimonia gyrposepala	tall hairy agrimony	CAX
Agrimonia pubescens	soft agrimony	WPNSTA/CAX
Agrimonia rostellata	beaked agrimony	WPNSTA/CAX
Agrostemma githago	corncockle	CAX
Alliaria petiolata	garlic mustard	CAX
Allium canadense	meadow garlic	CAX
Allium vineale	wild garlic	WPNSTA/CAX
Amaranthus hybridus	pigweed	CAX
Ambrosia artemisifolia	common ragweed	CAX
Amphicarpaea bracteata	hog peanut	WPNSTA/CAX
Analallis arvebnsis	scarlet pimpernel	CAX
Antennaria plantaginifolia	pussy toes	CAX
Antennaria solitaria	pussy toes	CAX
Apios americana	American potato-bean	CAX
Aplectryum hyemale	puttyroot	CAX
Apocynum cannabinum	clasping-leaf dogbane	CAX
Aquilegia canadensis	red columbine	WPNSTA/CAX
Arabidopsis thaliana	mouse-ear cress	CAX
Aralia racemosa	spikenard	CAX
Arisaema triphyllum	jack-in-the-pulpit	WPNSTA/CAX
Aristolochia serpentaria	Virginia snakeroot	WPNSTA/CAX
Arnoglossum atriplicifolium	pale Indian plaintain	WPNSTA
Asarum canadense	wild ginger	WPNSTA/CAX
Asarum canadense	wild ginger	CAX
Asclepias amplexicaulis	milkweed	CAX
Asclepias incarnata	swamp milkweed	CAX
Asclepias syriaca	common milkweed	CAX
Asclepias tuberosa	butterfly weed	CAX
Asclepias variegata	milkweed	CAX
Asparagus officinalis	asparagus	CAX
Asplenium platyneuron	ebony spleenwort	CAX
Bidens frondosa	devil's beggartick	WPNSTA
Boehmeria cylindrica	false nettle	WPNSTA
Borrichia frutescens	sea-oxeye	WPNSTA
Brasenia shreberi	watershield	CAX
Brassica napus	turnip	CAX
Cacalia atriplicifolia	Indian-plantain	CAX
Cakile edentula	hooker, sea rocket	CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Caltha palustris	marsh-marigold	CAX
Calystegia sepium	hedge bindweed	CAX
Capsella bursa-pastoris	shepherd's purse	CAX
Cardamine concatenata	cutleaf toothwort	WPNSTA/CAX
Cardamine hirsuta	bitter cress	CAX
Cardamine pennsylvanica	bitter cress	CAX
Cassia marilandica	wild senna	CAX
Cassia nictitans	wild sensitive plant	CAX
Cassia obtusifolia	sicklepod	CAX
Cechrus tribuloides	sandspurs	CAX
Centaurea cyanus	bachelor's button	CAX
Centrosema virginianum	butterfly pea	CAX
Cerastium glomeratum	mouse-ear chickweed	CAX
Cerastium holosteoides	mouse-ear chickweed	CAX
Chaerophyllum tainturieri	wild chervil	CAX
Chenopodium ambrosioides	mexican-tea	CAX
Chimaphila maculata	striped wintergreen	WPNSTA/CAX
Chrysanthemum leucanthemum	ox-eye daisy	CAX
Cichorium intybus	chicory	CAX
Cicuta maculata	water hemlock	WPNSTA/CAX
Cimicifuga racemosa	black cohosh	WPNSTA/CAX
Circaea lutetiana	broadleaf enchanter's nightshade	WPNSTA/CAX
Circaea lutetiana	enchanter's nightshade	CAX
Cirsium discolor	field thistle	CAX
Cirsium lanceolatus	bull thistle	CAX
Claytonia virginica	spring beauty	CAX
Clitoria mariana	butterfly pea	WPNSTA
Commelina communis	day flower	CAX
Commelina virginica	Virginia dayflower	WPNSTA
Conoclinium coelestinum	blue mist flower	WPNSTA
Corallorhiza odontorhiza	autumn coralroot	CAX
Crotalaria sagittalis	weedy rattlebox	CAX
Cryptotaenia canadensis	honewort	WPNSTA/CAX
Cunila origanoides	wild basil	CAX
Cuscuta campestris	field dodder	CAX
Cuscuta gronovii	dodder	CAX
Cynoglossum virginianum	wild comfry	WPNSTA/CAX
Cypripedium acaule	pink lady's slipper	CAX
Datura stramonium	jimson weed	CAX
Daucus carota	wild carrot	CAX
Decodon verticillatus	water loosestrife	CAX
Decumaria barbara	climbing hydrangea	CAX
Delphinium ajacis	larkspur	CAX
Dennstaedtia punctilobula	hay-scented fern	CAX
Desmanthus illinoensis	prairie bundle-flower	CAX
Desmodium canescens	hoary tick-trefoil	CAX
Desmodium nudiflorum	naked-flowered tick trefoil	WPNSTA
Desmodium paniculatum	panicled tick-trefoil	CAX
Desmodium pauciflorum	fewflower ticktrefoil	WPNSTA/CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Desmodium perplexum	perplexed ticktrefoil	WPNSTA/CAX
Desmodium perplexum	tick-trefoil	CAX
Desmodium rotundifolium	dollar leaf	CAX
Desmodium viridiflorum	velvet-leaved tick trefoil	CAX
Dianthus armeria	pink	CAX
Diodia teres	poorjoe	WPNSTA/CAX
Diodia virginiana	Virginia buttonweed	WPNSTA/CAX
Diodia virginiana	buttonweed	CAX
Dioscorea quaternata	four-leaf yam	WPNSTA
Dioscorea villosa	wild yam	CAX
Draba verna	whitlow grass	CAX
Duchesnea indica	Indian strawberry	WPNSTA
Elephantopus carolinianus	Carolina elephant's foot	WPNSTA
Elephantopus tomentosus	elephant's foot	WPNSTA
Epifagus virginiana	beechdrops	WPNSTA
Equisetum arvense	field horsetail	WPNSTA
Equisetum hyemale	scouring rush	WPNSTA
Erechtites hieracifolia	fireweed	WPNSTA
Erigeron pulchellus var. pulchellus	robin's plantain	WPNSTA
Eupatoriadelphus fistulosus	trumpetweed	CAX
Eupatorium aromaticum	thoroughwort	CAX
Eupatorium capillifolium	dogfennel	WPNSTA/CAX
Eupatorium coelestinyum	mistflower	CAX
Eupatorium hyssopifolium	hyssopleaf eupatorium	CAX
Eupatorium rotundifolium	roundleaf thorough-wort	CAX
Eupatorium rugosum	rough-leaf thorough-wort	CAX
Eupatorium serotinum	late-flowering	CAX
Euphorbia ammannioides	spurge	CAX
Euphorbia maculata	spotted broomsedge	CAX
Euphorbia supina	prostrate spurge	CAX
Euthamia graminifolia	flat-top goldenrod	CAX
Foeniculum vulgare	fennel	CAX
Fragaria virginiana	strawberry	CAX
Galactia volubilis	downy milk pea	CAX
Galium aparine	cleavers/rough bedstraw/stickwilly	WPNSTA/CAX
Galium circaezans	licorice bedstraw	WPNSTA/CAX
Galium obtusum	blunt-leaved bedstraw	CAX
Galium obtusum ssp. filiflium	bluntleaf bedstraw	WPNSTA/CAX
Galium parisiense	wall bedstraw	CAX
Galium pilosum	bedstraw	CAX
Galium triflorum	fragrant bedstraw	WPNSTA/CAX
Galium uniflorum	oneflower bedstraw	WPNSTA/CAX
Gelsemium sempervirens	yellow jessamine	CAX
Geranium carolinianum	carolina cranes-bill	CAX
Geranium molle	dovesfoot cranes-bill	CAX
Geum canadense	white avens	WPNSTA/CAX
Geum lacineatum	rough avens	WPNSTA
Geum virginianum	cream avens	WPNSTA
Glechoma hederacea	gill over the ground	CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Gnaphalium obtusifolium	rabbit tobacco	CAX
Gnaphalium purpureum	cudweed	CAX
Goodyera pubescens	downy rattlesnake plantain	WPNSTA
Helonias bullata	swamp-pink	WPNSTA
Hepatica nobilis	roundlobe hepatica	WPNSTA
Hexalectris spicata	crested coralroot	WPNSTA
Hexastylis virginica	Virginia heartleaf	WPNSTA
Hibiscus moscheutos	eastern rosemallow	WPNSTA
Hieracium gronovii	queendevil	WPNSTA
Houstonia purpurea	bluets	WPNSTA
Hydrangea arborescens	wild hydrangia	WPNSTA
Hydrocotyle umbellata	pennywort	WPNSTA
Hydrocotyle verticillata	whorled penny-wort	CAX
Hypericum densiflorum	brushy St. Johnswort	WPNSTA
Hypericum gentianoides	pineweed	CAX
Hypericum hypercoides	St. Andrew's cross	CAX
Hypericum mutilum	slender St. John's wort	CAX
Hypericum perforatum	St. John's wort	CAX
Hypericum punctatum	dotted St. John's wort	CAX
Hypochoeria radicata	cat's ear	CAX
Hypoxis hirsuta	yellow star-grass	CAX
Impatiens capensis	jewelweed	WPNSTA/CAX
Ipomoea coccinea	red morning glory	CAX
Ipomoea hederacea	ivy-leaved morning glory	CAX
Ipomoea lacunosa	white morning glory	CAX
Iris pseudoacorus	yellow iris	CAX
Kosteletzkya virginica	seashore mallow	WPNSTA/CAX
Krigia virginica	dwarf dandelion	CAX
Kummerowia stipulacea	Korean clover	WPNSTA
Kummerowia striata	Japanese clover	WPNSTA
Lactuca canadensis	wild lettuce	CAX
Lactuca floridana	wild lettuce	CAX
Lactuca saligna	willow-leaved lettuce	CAX
Lactuca serriola	prickly lettuce	CAX
Lamium amplexicaule	henbit	CAX
Laportea canadensis	wood nettle	CAX
Lathyrus hirsutus	hairy peavine	CAX
Lechea racemulosa	pin-weed	CAX
Lepidium virginicum	poor-man's peppergrass	CAX
Lespedeza capitata	round-head bushclover	CAX
Lespedeza cuneata	Chinese (serecia) lespedeza	WPNSTA/CAX
Lespedeza procumbens	trailing bushclover	CAX
Lespedeza repens	creeping bushclover	CAX
Liparis lillifolia	brown widelip orchid	WPNSTA
Lobelia puberula	downy lobelia	CAX
Lobelia siphilitica	great lobelia	CAX
Lonicera japonica	Japanese honeysuckle	CAX
Ludwigia alternifolia	bushy seedbox	CAX
Ludwigia palustris	marsh seedbox	CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Lychnis alba	white campion	CAX
Lycopodium flabelliforme	running-pine	CAX
Lycopus virginicus	water horehound	CAX
Lythrum lineare	narrow-leaved loosestrife	WPNSTA
Maianthemum racemosum	feathery false lily of the valley	WPNSTA
Malaxis spicata	Florida adder's mouth	WPNSTA/CAX
Malaxis unifolia	green adder's mouth orchid	WPNSTA/CAX
Matelea suberosa	angular-fruit milkvine	CAX
Medicago lupulina	black medic	CAX
Melilotus alba	white sweet clover	CAX
Melothria pendula	creeping cucumber	CAX
Melotus officinalis	yellow sweet clover	CAX
Mentha arvensia	field mint	CAX
Mentha piperita	peppermint	CAX
Mikania scandens	climbing hempweed	CAX
Mitchella repens	partridge berry	WPNSTA/CAX
Mollugo verticillata	green carpet-weed	CAX
Monarda punctata	horse-mint	CAX
Monotropa hypopithys	pinesap	WPNSTA/CAX
Monotropa uniflora	Indian pipe	CAX
Myostis laxa	forget-me-not	CAX
Myostis macrosperma	forget-me-not	CAX
Nuphar advena	spatterdock	WPNSTA
Obolaria virginica	pennywort	CAX
Oenothera parviflora	evening primrose	CAX
Osmorhiza longistylis	longstyle sweetroot	WPNSTA
Osmunda regalis	royal fern	CAX
Oxalis dillenii	wood sorrel	CAX
Oxalis florida	wood sorrel	CAX
Oxalis stricta	common yellow oxalis	WPNSTA/CAX
Oxalis violacea	violet wood sorrel	CAX
Parnasssia asarifolia	kidneyleaf grass-of-parnassus	WPNSTA
Parthenocissus quinquefolia	Virginia creeper	CAX
Passiflora incarnata	purple passion-flower	CAX
Passiflora lutea	passion-flower	CAX
Pedicularis lanceolata	swamp lousewort	WPNSTA/CAX
Peltandra virginica	pickerelweed	WPNSTA/CAX
Penax quinquefolium	ginseng	CAX
Penstemon laevigatus	smooth beardtongue	CAX
Perilla frutescens	beef-steak plant	CAX
Phaseolus polystachios	wild bean	CAX
Phegopteris hexagonoptera	broad beach fern	CAX
Phryma leptostachya	lopseed	WPNSTA/CAX
Physalis sp.	ground cherry	CAX
Phytolacca americana	pokeweed	CAX
Pilea fontana	lesser clearweed	WPNSTA
Pilea pumila	clearweed	WPNSTA/CAX
Plantago aristata	bracted plantain	CAX
Plantago lanceolata	buckhorn plantain	CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Plantago rugelii	common plantain	CAX
Plantago virginica	plantain	CAX
Pluchea purpurascens	camphorweed	CAX
Podophyllum peltatum	may-apple	CAX
Polygala incarnata	pink milkwort	CAX
Polygonatum biflorum	smooth Solomon's seal	WPNSTA
Polygonum arifolium	tearthumbs	WPNSTA
Polygonum avicula	knotweed	CAX
Polygonum pennsylvanicum	Pennsylvania smartweed	CAX
Polygonum persicaria	lady's thumb	CAX
Polygonum punctatum	dotted smartweed	WPNSTA/CAX
Polygonum sagitatum	tearthumbs	WPNSTA
Polygonum scandens	climbing buckwheat	CAX
Polygonum setaceum	bog smartweed	WPNSTA/CAX
Polygonum tenue	tenue	CAX
Polygonum virginianum	jumpseed	WPNSTA
Polypodium polypodioides	resurrection fern	CAX
Pontederia cordata	pickerelweed	WPNSTA
Ponthieva racemosa	hairy shadow witch orchid	WPNSTA
Potentilla simplex	common cinquefoil	WPNSTA
Prenanthes altissima	tall rattlesnake root	WPNSTA
Pseudognaphalium helleri	Heller's cudweed	WPNSTA
Pyrrhopappus carolinianus	false dandelion	CAX
Ranunculus abortivus	buttercup	CAX
Ranunculus ambigens	spearwort	CAX
Ranunculus bulbosas	buttercup	CAX
Ranunculus recurvatus	blisterwort	WPNSTA
Ranunculus repens	creeping buttercup	CAX
Rhexia mariana	Maryland meadow beauty	WPNSTA/CAX
Rhexia virginica	meadow beauty	WPNSTA
Rudbeckia hirta	black-eyed Susan	CAX
Rudbeckia lacinata	coneflower	CAX
Ruellia caroliniensis	wild petunia	WPNSTA
Rumex acetosella	sheep-sorrel	CAX
Rumex conglomeratus	clustered dock	CAX
Rumex crispus	curly dock	CAX
Rumex verticillatus	swamp dock	WPNSTA
Sabatia stellaris	sea rose-pink	WPNSTA
Sabatiua angularis	rose-pink	CAX
Salicornia virginica	a glasswort	WPNSTA
Salvia lyrata	lyreleaf sage	WPNSTA/CAX
Samolus parviflorus	water pimpernel	CAX
Samolus valerandi ssp. parviflorus	seaside brookweed	WPNSTA
Sanguinaria canadensis	bloodroot	WPNSTA/CAX
Sanicula canadensis	black snakeroot	WPNSTA
Sarcocornia perennis	woody glasswort	WPNSTA
Satureja vulgaris	savory	CAX
Saururus cernuss	lizard's tail	WPNSTA
Saururus cernuus	lizard's tail	CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Saxifraga virginiensis	saxifrage	CAX
Scleranthus annus	blue skullcap	CAX
Scrophularia lanceolata	lanceleaf figwort	CAX
Scutellaia lateriflora	blue skullcap	WPNSTA/CAX
Scutellaria elliptica	hairy skullcap	WPNSTA/CAX
Scutellaria lateriflora	blue skullcap	CAX
Selaginella apoda	meadow spikemoss	CAX
Senecio aureus	golden ragwort	WPNSTA/CAX
Senecio smallii	Small's groundsel	CAX
Sherardia arvensis	blue field madder	CAX
Sida spinosa	prickly sida	CAX
Silene cucubalus	bladder campion	CAX
Silphium trifoliatum	whorled rosin-weed	CAX
Simlax bona-nox	greenbrier	CAX
Simlax rotundifolia	greenbrier	CAX
Smallanthus uvedalius	hairy leafcup	WPNSTA
Solidago caesia	wreath goldenrod	WPNSTA
Solidago erecta	goldenrod	CAX
Solidago flexicaulis	zig-zag goldenrod	WPNSTA
Solidago graminifolia	flat-topped goldenrod	CAX
Solidago microcephala	large head goldenrod	CAX
Solidago nemoralis	dwarf goldenrod	CAX
Solidago pinetorum	goldenrod	CAX
Solidago rugosa	wrinkled goldenrod	CAX
Solidago sempervirens	seaside goldenrod	CAX
Sonchus asper	spinyleaved sow-thistle	CAX
Specularia perfoliata	Venus' looking glass	CAX
Spiranthes vernalis	spring ladies tresses	CAX
Sporobolus indicus	smut grass	CAX
Stellaria media	common chickweed	CAX
Strophostyles helvula	trailing fuzzybean	CAX
Strophostyles umbellata	pink wildbean	CAX
Symphyotrichum cordifolium	common blue wood aster	WPNSTA/CAX
Symphyotrichum lateriflorus	calico aster	WPNSTA
Symplocarpus foetidus	skunk-cabbage	WPNSTA
Taraxacum officinale	dandelion	CAX
Teucrium canadense	Canada germander (wood sage)	WPNSTA/CAX
Thelypteris hexagonoptera	broad beech-fern	CAX
Thelypteris noveboracensis	New York fern	CAX
Thelypteris palustris	marsh fern	CAX
Tipularia discolor	cranefly orchid/crippled cranefly	WPNSTA/CAX
Torilis arvensis	hedge-parsley	CAX
Tovara virginiana	jumpseed	CAX
Toxicodendron radicans	poison ivy	CAX
Triadenum virginicum	marsh St. John's-wort	WPNSTA
Trichostema dichotomum	blue curls	CAX
Trifolium arvense	rabbit foot clover	CAX
Trifolium campestre	low hop clover	CAX
Trifolium dubium	suckling clover	CAX

Scientific Name	Common Name	Area
Herbaceous continued…		
Trifolium pratense	red clover	CAX
Trifolium repens	white clover	CAX
Utricularia gibba	bladderwort	CAX
Uvularia perfoliata	bellwort	WPNSTA
Uvularia sessilifolia	bellwort	WPNSTA/CAX
Valerianella locusta	corn salad	CAX
Verbena brasiliensis	Brazilian vervain	WPNSTA
Verbena hastata	blue vervain/swamp verbena	WPNSTA
Verbesina alternifolia	wingstem	WPNSTA
Verbesina virginica	white crownbeard	WPNSTA
Veronica arvensis	corn speedwell	CAX
Veronica glauca	speedwell	CAX
Veronica hederaefolia	ivy-leaved speedwell	CAX
Veronica persica	speedwell	CAX
Vicia angustifolia	vetch	CAX
Vicia cracca	cowvetch	CAX
Vicia dasycarps	smooth vetch	CAX
Vicia hirsuta	vetch	CAX
Vinca minor	periwinkle	CAX
Viola palmata	violet pollard	CAX
Viola papilionaceae	violet	CAX
Viola rafinesquii	field pansy	CAX
Viola sororia	common blue violet	WPNSTA
Vitis aestivalis	summer grape	CAX
Vitis rotundifolia	muscadine	CAX
Vitis vulpina	frost grape	CAX
Woodwardia areolata	netted chain-fern	CAX
Xanthum strumarium	cocklebur	CAX
Yucca filamentosa	bear-grass	CAX
Ferns/Club-Mosses		
Adiantum pedatum	northern maidenhair	WPNSTA
Asplenium platyneuron	ebony spleenwort	WPNSTA
Athyrium filix foemina	southern lady fern	WPNSTA
Botrychium biternatum	sparse lobe grape fern	WPNSTA
Botrychium virginianum	rattlesnake fern	WPNSTA
Dryopteris celsa	log fern	WPNSTA
Lycopodium digitatum	fan club-moss	WPNSTA
Lycopodium obscurum	princess-pine	WPNSTA
Onoclea sensibilis	sensitive fern	WPNSTA
Osmunda cinnamomea	cinnamon fern	WPNSTA
Osmunda regalis	royal fern	WPNSTA
Phegopteris hexagonoptera	broad beechfern	WPNSTA
Polystichum acrosticoides	Christmas fern	WPNSTA
Thelypteris noveboracensis	New York fern	WPNSTA
Woodwardia areolata	netted chain fern	WPNSTA
Woodwardia virginica	Virginia chain fern	WPNSTA

Forbs/Herbs		
Agalinis maritima	salt-marsh false foxglove	WPNSTA
Ageratina altissima var. altissima	white snakeroot	WPNSTA
Aquilegia canadensis	red columbine	WPNSTA
Agrimonia pubescens	soft agrimony	WPNSTA
Agrimonia rostellata	beaked agrimony	WPNSTA
Allium vineale	wild garlic	WPNSTA
Amphicarpaea bracteata	hog peanut	WPNSTA
Arisaema tryphyllum	Jack-in-the-pulpit	WPNSTA
Aristolochia serpentaria	Virginia snakeroot	WPNSTA
Arnoglossum atriplicifolium	pale Indian plaintain	WPNSTA
Asarum canadense	wild ginger	WPNSTA/CAX
Boehmeria cylindrica	false nettle	WPNSTA
Borrichia frutescens	sea-oxeye	WPNSTA
Bidens frondosa	devil's beggartick	WPNSTA
Cardamine concatenata	cutleaf toothwort	WPNSTA/CAX
Conoclinium coelestinum	blue mist flower	WPNSTA
Chimaphila maculata	striped wintergreen	WPNSTA/CAX
Cicuta maculata	water hemlock	WPNSTA/CAX
Cimicifuga racemosa	black cohosh	WPNSTA/CAX
Circaea lutetiana	broadleaf enchanter's nightshade	WPNSTA/CAX
Clitoria mariana	butterfly pea	WPNSTA
Commelina virginica	Virginia dayflower	WPNSTA
Cynoglossum virginianum	wild comfry	WPNSTA/CAX
Desmodium nudiflorum	naked-flowered tick trefoil	WPNSTA
Desmodium pauciflorum	fewflower ticktrefoil	WPNSTA/CAX
Desmodium perplexum	perplexed ticktrefoil	WPNSTA/CAX
Diodia teres	poorjoe	WPNSTA/CAX
Diodia virginiana	Virginia buttonweed	WPNSTA/CAX
Dioscorea quaternata	four-leaf yam	WPNSTA
Duchesnea indica	Indian strawberry	WPNSTA
Elephantopus carolinianus	Carolina elephant's foot	WPNSTA
Elephantopus tomentosus	elephant's foot	WPNSTA
Epifagus virginiana	beechdrops	WPNSTA
Erechtites hieracifolia	fireweed	WPNSTA
Erigeron pulchellus var. pulchellus	robin's plantain	WPNSTA
Equisetum arvense	field horsetail	WPNSTA
Equisetum hyemale	scouring rush	WPNSTA
Eupatorium capillifolium	dog fennel	WPNSTA
Galium aparine	cleavers/rough bedstraw/stickwilly	WPNSTA/CAX
Galium obtusum ssp. filiflium	bluntleaf bedstraw	WPNSTA/CAX
Galium circaezans	licorice bedstraw	WPNSTA/CAX
Galium triflorum	fragrant bedstraw	WPNSTA/CAX
Galium uniflorum	oneflower bedstraw	WPNSTA/CAX
Geum canadense	white avens	WPNSTA/CAX
Geum lacineatum	rough avens	WPNSTA
Geum virginianum	cream avens	WPNSTA
Goodyera pubescens	downy rattlesnake plantain	WPNSTA
Helonias bullata	swamp-pink	WPNSTA
Hepatica nobilis	roundlobe hepatica	WPNSTA
Hexalectris spicata	crested coralroot	WPNSTA

Scientific Name	Common Name	Area
Forbs/Herbs continued…		
Hexastylis virginica	Virginia heartleaf	WPNSTA
Hibiscus moscheutos	eastern rosemallow	WPNSTA
Hieracium gronovii	queendevil	WPNSTA
Houstonia purpurea	bluets	WPNSTA
Hydrangea arborescens	wild hydrangia	WPNSTA
Hypericum densiflorum	brushy St. Johnswort	WPNSTA
Hydrocotyle umbellata	pennywort	WPNSTA
Impatiens capensis	jewelweed	WPNSTA/CAX
Kosteletzkya virginica	seashore mallow	WPNSTA/CAX
Kummerowia striata	Japanese clover	WPNSTA
Kummerowia stipulacea	Korean clover	WPNSTA
Lespedeza cuneata	Chinese (serecia) lespedeza	WPNSTA/CAX
Liparis lillifolia	brown widelip orchid	WPNSTA
Lythrum lineare	narrow-leaved loosestrife	WPNSTA
Malaxis spicata	Florida adder's mouth	WPNSTA/CAX
Malaxis unifolia	green adder's mouth orchid	WPNSTA/CAX
Maianthemum racemosum	feathery false lily of the valley	WPNSTA
Mitchella repens	partridge berry	WPNSTA/CAX
Monotropa hypopithys	pinesap	WPNSTA/CAX
Nuphar advena	spatterdock	WPNSTA
Oxalis stricta	common yellow oxalis	WPNSTA/CAX
Osmorhiza longistylis	longstyle sweetroot	WPNSTA
Parnasssia asarifolia	kidneyleaf grass-of-parnassus	WPNSTA
Peltandra virginica	pickerelweed	WPNSTA/CAX
Pedicularis lanceolata	swamp lousewort	WPNSTA/CAX
Phryma leptostachya	lopseed	WPNSTA/CAX
Pilea fontana	lesser clearweed	WPNSTA
Pilea pumila	clearweed	WPNSTA/CAX
Polygonatum biflorum	smooth Solomon's seal	WPNSTA
Polygonum sagitatum	tearthumbs	WPNSTA
Polygonum arifolium	tearthumbs	WPNSTA
Polygonum punctatum	dotted smartweed	WPNSTA/CAX
Polygonum setaceum	bog smartweed	WPNSTA/CAX
Polygonum virginianum	jumpseed	WPNSTA
Pontederia cordata	pickerelweed	WPNSTA
Potentilla simplex	common cinquefoil	WPNSTA
Ponthieva racemosa	hairy shadow witch orchid	WPNSTA
Prenanthes altissima	tall rattlesnake root	WPNSTA
Pseudognaphalium helleri	Heller's cudweed	WPNSTA
Ranunculus recurvatus	blisterwort	WPNSTA
Rhexia mariana	Maryland meadow beauty	WPNSTA/CAX
Rhexia virginica	meadow beauty	WPNSTA
Ruellia caroliniensis	wild petunia	WPNSTA
Rumex verticillatus	swamp dock	WPNSTA
Samolus valerandi ssp. parviflorus	seaside brookweed	WPNSTA
Sabatia stellaris	sea rose-pink	WPNSTA
Salicornia virginica	a glasswort	WPNSTA
Salvia lyrata	lyreleaf sage	WPNSTA/CAX
Sanguinaria canadensis	bloodroot	WPNSTA/CAX

Scientific Name	Common Name	Area
Forbs/Herbs continued…		
Sanicula canadensis	black snakeroot	WPNSTA
Sarcocornia perennis	woody glasswort	WPNSTA
Saururus cernuss	lizard's tail	WPNSTA
Scutellaria elliptica	hairy skullcap	WPNSTA
Scutellaia lateriflora	blue skullcap	WPNSTA/CAX
Senecio aureus	golden ragwort	WPNSTA/CAX
Smallanthus uvedalius	hairy leafcup	WPNSTA
Solidago caesia	wreath goldenrod	WPNSTA
Solidago flexicaulis	zig-zag goldenrod	WPNSTA
Symphyotrichum cordifolium	common blue wood aster	WPNSTA/CAX
Symphyotrichum lateriflorus	calico aster	WPNSTA
Symplocarpus foetidus	skunk-cabbage	WPNSTA
Teucrium canadense	Canada germander (wood sage)	WPNSTA/CAX
Tipularia discolor	cranefly orchid/crippled cranefly	WPNSTA/CAX
Triadenum virginicum	marsh St. John's-wort	WPNSTA
Uvularia perfoliata	bellwort	WPNSTA
Uvularia sessilifolia	bellwort	WPNSTA/CAX
Verbena hastata	blue vervain/swamp verbena	WPNSTA
Verbena brasiliensis	Brazilian vervain	WPNSTA
Verbesina alternifolia	wingstem	WPNSTA
Verbesina virginica	white crownbeard	WPNSTA
Viola sororia	common blue violet	WPNSTA
Cryptotaenia canadensis	honewort	WPNSTA
Graminoids		
Agrostis perennans	bent grass	CAX
Agrostis stolonifera	bent grass	CAX
Aira elegans	hair grass	CAX
Andropogon glomeratus	bushy bluestrem	WPNSTA
Andropogon ternarius	broom-straw	CAX
Andropogon virginica	broomsedge	WPNSTA/CAX
Anthoxanthum odoratum	sweet vernal grass	CAX
Aristida oligantha	three awn grass	CAX
Arundinaria gigantea	giant cane	CAX
Athraxon hispidus	athraxon	CAX
Brachyelytrum erectum	bearded shorthusk	WPNSTA
Carex albicans var. emmonsii	Emmon's sedge	WPNSTA
Carex amphibola	eastern narrowleaf sedge	WPNSTA
Carex blanda	Eastern woodland sedge	WPNSTA
Carex crinita	fringed sedge	WPNSTA
Carex digitalis	slender woodland sedge	WPNSTA
Carex granularis	limestone meadow sedge	WPNSTA
Carex intumescens	greater bladder sedge	WPNSTA
Carex joorii	cypress swamp sedge	WPNSTA
Carex laevivaginata	smoothsheath sedge	WPNSTA
Carex laxiculmis var. laxiculmis	spreading sedge	WPNSTA
Carex laxiflora var. laxiflora	broad looseflower sedge	WPNSTA
Carex lurida	shallow sedge	CAX
Carex rosea	rosy sedge	WPNSTA/CAX

Scientific Name	Common Name	Area
Graminoids continued…		
Carex stricta	tussock sedge	WPNSTA
Carex swanii	sedge	CAX
Carex vulpinoidea	sedge	CAX
Chasmanthium sessiliflorum	long-leaf spikegrass	WPNSTA
Cinna arundinacea	sweet woodreed	WPNSTA/CAX
Cynodon dactylon	Bermudagrass	CAX
Cyperus brevifolioides	short-leaf flatsedge	CAX
Cyperus esculentus	nut grass	CAX
Cyperus iria	iria flatsedge	CAX
Cyperus lancastriensis	many-flower flatsedge	CAX
Cyperus odoratus	rusty flatsedge	CAX
Cyperus ovularis	globose flatsedge	CAX
Cyperus rotundus	purple flatsedge	CAX
Cyperus strigosus	straw-color flatsedge	CAX
Danthonia seriacea	oat grass	CAX
Danthonia sericea	downy danthonia	WPNSTA/CAX
Dichanthelium angustifolium	narrow-leaved panic-grass	CAX
Dichanthelium boscii	Bosc's panicgrass	WPNSTA
Dichanthelium clandestinum	deer tongue	WPNSTA/CAX
Dichanthelium commutatum	variable panicgrass	WPNSTA/CAX
Dichanthelium dichotomum	Cypress panicgrass	WPNSTA/CAX
Dichanthelium laxiflorum	lax-flower witchgrass	CAX
Dichanthelium oligosanthes	Hellar's witchgrass	CAX
Dichanthelium ravenellii	Ravenel's witchgrass	CAX
Dichanthelium scoparium	broom panic grass	CAX
Dichanthelium sphaerocarpon	round-seed panic grass	CAX
Digitaria sanguinalis	crabgrass	CAX
Distichlis spicata	saltgrass	WPNSTA
Distichlis spicata	salt grass	CAX
Dulichium arundinaceum	three-way sedge	WPNSTA
Echinochloa colona	jungle-rice	CAX
Echinochloa crusgalli	barnyard grass	CAX
Eleocharis obtusa	spike-rush	CAX
Eleocharis sp.	a spikerush	WPNSTA
Eleusine indica	goosegrass	CAX
Elymos roparius	wild rye grass	CAX
Elymos virginicus	wild rye grass	CAX
Elymus hystrix var. hystrix	eastern bottlebrush grass	WPNSTA
Festuca subverticillata	nodding fescue	WPNSTA
Glyceria obtusa	coastal mannagrass	WPNSTA
Glyceria striata	fowl mannagrass	WPNSTA
Juncus coriaceus	leathery juncus	WPNSTA/CAX
Juncus effusus	common rush	WPNSTA/CAX
Juncus filiformis	thread rush	WPNSTA
Juncus gerardii	black grass rush	WPNSTA
Juncus roemerianus	black needlerush	WPNSTA
Juncus tenuis	path rush	CAX
Leersia oryzoides	rice cutgrass	WPNSTA
Leersia virginica	whitegrass	WPNSTA

Scientific Name	Common Name	Area
Graminoids continued…		
Lolium multiflorum	rye grass	CAX
Luzula acuminata	woodrush	WPNSTA/CAX
Luzula bulbosa	woodrush	CAX
Melica mutica	melic grass	CAX
Microstegium vimineum	microstegium/Japanese stiltgrass	WPNSTA/CAX
Muhlenbergia schreberi	muhly	CAX
Panicum anceps	beaked panic grass	CAX
Panicum dichotomiflorum	fall panic grass	CAX
Panicum verrucosum	warty panicgrass	WPNSTA
Panicum virgatum	switchgrass	CAX
Paspalum dilatatum	dallisgrass	CAX
Paspalum floridanum	Florida paspalum	CAX
Paspalum laeve	field paspalum	WPNSTA
Paspalum urvillei	vasy grass	CAX
Phalaris arundinacea	reed-canary grass	CAX
Phragmites australis	common reed	WPNSTA
Poa autumnalis	autumn bluegrass	WPNSTA
Poa autumnalis	blue grass	CAX
Poa pratensis	blue grass	CAX
Rhynchospora inexpasus	nodding beaksedge	WPNSTA
Schizachyrium scoparium	little bluestem	CAX
Schoenoplectus robustus	saltmarsh bulrush	WPNSTA
Scirpus cyperinus	woolgrass	WPNSTA
Scirpus lineatus	drooping bulrush	WPNSTA
Scirpus lineatus	drooping bulrush	CAX
Scripus atrovirens	bulrush	CAX
Scripus cyperinus	bulrush	CAX
Scripus robustus	bulrush	CAX
Setaria faberi	foxtail grass	CAX
Setaria geniculata	foxtail grass	CAX
Setaria glauca	yellow bristle grass	CAX
Setaria viridis	green bristle grass	CAX
Sorghastrum nutans	Indian grass	CAX
Sorghum halepense	Johnson grass	WPNSTA/CAX
Sorghum vulgare	sugar sorghum	CAX
Spartina alterniflora	saltmarsh cordgrass	WPNSTA/CAX
Spartina cynosuroides	big cordgrass	WPNSTA
Spartina patens	saltmeadow hay	WPNSTA/CAX
Tridens flavus	purple top	CAX
Tridens strictus	long-spike tridens	CAX
Typha angustifolia	narrow-leaved cattail	WPNSTA
Zizania aquatica	wild rice	WPNSTA
Trees		
Acer barbatum	southern sugar maple	WPNSTA
Acer negundo	box elder	CAX
Acer rubrum	red maple	WPNSTA/CAX
Ailanthus altissima	tree of heaven	WPNSTA/CAX
Albizia julibrissin	mimosa	WPNSTA

Scientific Name	Common Name	Area
Trees continued…		
Amelanchier arborea	common serviceberry	WPNSTA
American Hornbeam	WPNSTA/CAX	WPNSTA
Asimina triloba	paw-paw	WPNSTA/CAX
Carpinus caroliniana	musclewood/ironwood/American Hornbeam	WPNSTA/CAX
Carya alba	mockernut hickory	WPNSTA
Carya cordiformis	bitternut hickory	WPNSTA/CAX
Carya glabra	pignut hickory	WPNSTA/CAX
Carya ovalis	red hickory	WPNSTA
Carya pallida	pale hickory	CAX
Celtis occidentalis	common hackberry	WPNSTA/CAX
Cercis canadensis var. canadensis	eastern redbud	WPNSTA/CAX
Cornus florida	flowering dogwood	WPNSTA/CAX
Diospyros virginiana	persimmon	WPNSTA/CAX
Fagus grandifolia	American beech	WPNSTA/CAX
Fraxinus americana	white ash	WPNSTA
Fraxinus pennsylvanica	green ash	WPNSTA/CAX
Ilex opaca	American holly	WPNSTA/CAX
Juglans cinera	butternut	WPNSTA
Juglans nigra	black walnut	WPNSTA/CAX
Juniperus virginiana	eastern red cedar	WPNSTA/CAX
Liquidambar styraciflua	sweetgum	WPNSTA/CAX
Liriodendron tulipifera	tulip poplar	WPNSTA
Magnolia grandiflora	southern magnolia	CAX
Magnolia tripetala	umbrella magnolia	WPNSTA
Magnolia virginiana	sweetbay magnolia	WPNSTA
Malus angustifolia	southern crabapple	WPNSTA
Morus alba	white mulberry	CAX
Morus rubra	red mulberry	WPNSTA/CAX
Nyssa sylvatica	black gum	WPNSTA/CAX
Oxydendrum arboreum	sourwood	WPNSTA/CAX
Paulownia tomentosa	princess tree	WPNSTA/CAX
Pinus serotina	pond pine	WPNSTA
Pinus taeda	loblolly pine	WPNSTA/CAX
Pinus virginiana	scrub pine/Virginia pine	WPNSTA/CAX
Plantanus occidentalis	sycamore	WPNSTA/CAX
Populus alba	white poplar	WPNSTA
Populus deltoids	eastern cottonwood	CAX
Prunus angustifolia	chickasaw plum	CAX
Prunus avium	sweet cherry	CAX
Prunus serotina var. serotina	black cherry	WPNSTA/CAX
Quercus alba	white oak	WPNSTA/CAX
Quercus coccinea	scarlet oak	WPNSTA
Quercus falcata	southern red oak	WPNSTA/CAX
Quercus lyrata	overcup oak	WPNSTA
Quercus marilandica	black jack oak	CAX
Quercus michauxii	swamp chestnut oak	WPNSTA/CAX
Quercus muehlenbergii	chinkapin oak	WPNSTA
Quercus nigra	water oak	WPNSTA
Quercus pagodifolia	cherrybark oak	CAX

Scientific Name	Common Name	Area
Trees continued…		
Quercus phellos	willow oak	WPNSTA
Quercus prinus	chestnut oak	WPNSTA
Quercus rubra	northern red oak	WPNSTA
Quercus shumardii	Shumard's oak	WPNSTA
Quercus stellata	post oak	WPNSTA
Quercus velutina	black oak	WPNSTA
Robinia pseudoacacia	black locust	CAX
Salix babylonica	weeping willow	CAX
Salix nigra	back willow	CAX
Sassafras albidum	sassafras	WPNSTA/CAX
Taxodium distichum	bald cypress	CAX
Ulmus americana	American elm	WPNSTA
Ulmus rubra	slippery elm	WPNSTA/CAX
Shrubs/Vines		
Alnus serrulata	hazel alder	CAX
Amelanchier arborea	serviceberry	CAX
Aralia spinosa	devil's walking stick	CAX
Baccharis halimifolia	groundsel-tree	CAX
Bignonia capreolata	crossvine	WPNSTA
Callicarpa americana	American beautyberry	WPNSTA/CAX
Campsis radicans	trumpet creeper	WPNSTA/CAX
Cephalanthus occidentalis	buttonbush	WPNSTA
Clematis virginiana	virgin's bower	WPNSTA
Cornus foemina	stiff dogwood	WPNSTA
Cornus stricta	swamp dogwood	CAX
Cynanchum laeve	honeyvine	WPNSTA
Cytisus scoparius	scotch broom	WPNSTA
Decodon verticillatus	swamp loosestrife	WPNSTA
Decumaria barbara	wood vamp	WPNSTA
Elaeagnus pugens	thorny olive	WPNSTA
Euonymus americanus	strawberry bush	WPNSTA/CAX
Gaylussacia baccata	black huckleberry	WPNSTA/CAX
Gaylussacia frondosa	dangleberry	WPNSTA
Hedera helix	English ivy	WPNSTA
Hydrangea arborescens	hydrangea	CAX
Hypericyum hypericoides	St. Andrew's cross	CAX
Iva frutescens	marsh elder	CAX
Kalmia latifolia	mountain laurel	WPNSTA/CAX
Lespedeza bicolor	bicolor lespedeza	CAX
Leucothoe racemosa	fetterbush	WPNSTA
Ligustrum sinense	Chinese privet	WPNSTA/CAX
Ligustrum vulgare	European privet	WPNSTA
Lindera benzoin	spicebush	WPNSTA/CAX
Lonicera japonica	Japanese honeysuckle	WPNSTA
Lyonia ligustrina	maleberry	WPNSTA
Matelea sp.	milkvine	WPNSTA
Menispermum canadense	common moonseed	WPNSTA
Mikania scandens	climbing hempvine	WPNSTA

Scientific Name	Common Name	Area
Shrubs/Vines continued…		
Morella cerifera	wax myrtle	WPNSTA
Parthenocissus quinquefolia	Virginia creeper	WPNSTA
Persea borbonia	red bay	WPNSTA
Phoradendron serotinum	mistletoe	WPNSTA
Rhododendron periclymenoides	pink rhododendron	WPNSTA/CAX
Rhus copallinum	shining sumac	CAX
Rosa carolina	wild rose	CAX
Rosa multiflora	multiflora rose	CAX
Rosa palustris	swamp rose	WPNSTA/CAX
Rubus argutus	sawtooth blackberry	WPNSTA/CAX
Rubus cuneifolius	blackberry	CAX
Rubus flagellaris	northern dewberry	WPNSTA
Rubus occidentalis	black raspberry	WPNSTA
Rubus pensilvanicus	Pennsylvania blackberry	WPNSTA
Sambucus nigra ssp. canadensis	common elderberry	WPNSTA
Smilax bona-nox	saw greenbrier	WPNSTA
Smilax glauca	cat greenbrier	WPNSTA
Smilax pulverulenta	downy carrionflower	WPNSTA
Smilax rotundifolia	greenbrier	WPNSTA
Toxicodendron radicans	poison ivy	WPNSTA
Trachelospermum difforme	climbing dogbane	WPNSTA
Vaccinium atrococcum	black highbush blueberry	CAX
Vaccinium corymbosum	highbush blueberry	WPNSTA
Vaccinium formosoum	southern blueberry	WPNSTA
Vaccinium pallidum	lowbush blueberry	WPNSTA
Vaccinium stamineum	deerberry	WPNSTA/CAX
Vaccinium vacillans	low blueberry	CAX
Viburnum acerifolium	mapleleaf viburnum	CAX
Viburnum nudum	possum-haw	WPNSTA
Viburnum prunifolium	black haw	WPNSTA/CAX
Viburnum rufidulum	rusty blackhaw	CAX
Vinca minor	common periwinkle	WPNSTA
Vitis aestivalis	summer grape	WPNSTA
Vitis rotundifolia	muscadine grape	WPNSTA/CAX
Vitis vulpina	frost grape	WPNSTA

APPENDIX D

Grounds Maintenance

Enclosure 1 Native Plants for Erosion Control
Enclosure 2 Native Plants for Landscaping
Enclosure 3 Pruning and Planting Guidelines
Enclosure 4 Native Warm Season Grasses

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

REVISED: JULY 2002

FREQUENTLY ASKED QUESTIONS (FAQ)

NATIVE VS. INVASIVE PLANT SPECIES FOR EROSION & SEDIMENT CONTROL

DCR's Natural Heritage (DNH) Program and other conservation agencies and organizations recognize as "invasive aliens" certain plant species advocated by DCR's Soil & Water Conservation (DSWC) Program in the *Virginia Erosion and Sediment Control Handbook*. This FAQ provides information regarding Virginia native and invasive alien plant species and guidance for using natives in lieu of invasive aliens for vegetative stabilization of land-disturbing activities regulated by the Virginia Erosion and Sediment Control Law and Regulations. This document promotes a balanced policy that advocates sound ecological stewardship, while still ensuring erosion control and compliance with the Law and Regulations. Visit DNH's website at: www.dcr.state.va.us/dnh for further information about native and invasive plant species and DSWC's website at www.dcr.state.va/sw/e&s for information about erosion and sediment control.

What is a Native Species?

Native species are those that naturally occur in the region in which they evolved. Plants evolve in specific habitats over extended periods of time in response to physical and biotic habitats processes that are characteristic of that place: the climate; the soils; the seasonal rainfall, drought, and frost; and interactions with other species occupying those habitats. Native species thus possess certain traits that enable them to thrive under local conditions.

What Are Invasive Alien Species and Why Are They of Concern?

Alien plants, also known as exotic or non-native, are species that have been introduced intentionally or accidentally by human activity into a region in which they did not evolve. Many alien species are well known and economically important in agriculture and horticulture, such as wheat, soybeans, and tulips. However, while some alien plants are beneficial and have little capacity to spread in the natural environment, a few are *invasive* and pose serious threats to both natural communities and rare species. Because of a lack of natural controls like insect pests and competitors, some invasive alien plants may escape cultivation, displace native plant species, reduce wildlife habitats, and alter ecosystem processes. The majority of invasive alien plants are problematic due to their ability to easily and rapidly disperse across the landscape. Given this possibility of colonization, use of these species for erosion and sediment control should be avoided when possible.

How Many Invasive Alien Plant Species Have Been Identified in Virginia?

Of the 4,000 alien plant species that have become naturalized in the U.S., approximately 400 are serious invaders. The Natural Heritage Program and the Virginia Native Plant Society, in cooperation with land managers and agencies, nurserymen, landscape architects, horticulturalists, and other partners, have identified 114 invasive alien plant species that threaten natural areas, forests, parks, and other conservation areas in Virginia. A complete list of invasive alien plants for Virginia is available on DNH's website.

Why is Vegetative Stabilization of Land-Disturbing Activities Required?

Virginia Erosion and Sediment Control Law defines a land-disturbing activity as any land change of 10,000 sq. ft. or greater that involves clearing, grading, excavating, transporting, and filling of land. The Virginia Erosion and Sediment Control Regulations and local ordinances that implement the Law delineate strict requirements for timely temporary or permanent stabilization of land-disturbing activities, including denuded areas, soil stockpiles, earthen structures, cut and fill slopes, and watercourses, to prevent soil erosion from occurring in the first place. Planting vegetation, namely grasses or other herbaceous plants, is an effective and economic method for achieving expedient site stabilization. A copy of the Law and Regulations are available on DSWC's website.

Have Invasive Alien Plants Been Recommended for Vegetative Stabilization by DCR?

Yes. There are eight plant species considered invasive aliens that are currently advocated for vegetative stabilization in the *Virginia Erosion and Sediment Control Handbook*. Chinese lespedeza (*Lespedeza cuneata*) and weeping lovegrass (*Eragrostis curvaula*) are recommended for Temporary Seeding (STD&SPEC 3.31), while chinese lespedeza, crownvetch (*Coronilla varia*), tall fescue (*Lolium elatior* or *pratense*), birdsfoot trefoil (*Lotus corniculatus*), orchardgrass (*Dactylis glomerata*), and redtop (*Agrostis gigantea*) are recommended for Permanent Seeding (STD&SPEC 3.32). Chinese lespedeza, tall fescue, and redtop are recommended for Stormwater Conveyance Channels (STD&SPEC 3.17), Common reed (*Phragmites communis*), tall fescue, and redtop for Vegetative Streambank Stabilization (STD&SPEC 3.22), and tall fescue for Sodding (STD&SPEC 3.33). However, DCR encourages the use of native plants whenever feasible as described in the remainder of this FAQ.

Should Any of the Invasive Plants in the Handbook Be Avoided Entirely?

Yes. DCR strongly discourages the use of **common reed** and **chinese lespedeza** since they are highly invasive, and there are equally effective alternatives that are less problematic. It is especially important to avoid using these species in stormwater channels and on streambanks, as planting in these habitats may facilitate their wider distribution.

What Criteria Should Be Met For Native Species To Be Used for Stabilization?

The plant species chosen for stabilization must always be matched to the characteristics (climate, soils, etc.) of the site/region and must be commercially available in that region. Further, because interest in using native species for erosion and sediment control is relatively recent, alternative native species may not have been thoroughly field-tested to document their efficacy for erosion and sediment control. DCR recommends native plants for vegetative stabilization if the following criteria are met:

(1) Slopes < 15% slope gradient
(2) Soils with K factors < 0.36 (soils are not highly erodible)
(3) For use along roadways, species height must comply with Virginia Department of Transportation visibility requirements and not have characteristics that are highly attractive to birds and mammals
(4) For use on stormwater conveyance channels and streambanks, species must have proven effectiveness at the expected maximum stormwater flow volume and velocity

Generally, flat to gently sloping, open areas where there is little traffic are appropriate locales for planting most of the alternatives species suggested below. Utility easements or rights-of-way, park like areas, greenways, and other open tracks of land are excellent places to propagate native plants. However, natives may be considered even if one of these criteria is not met if there is sufficient evidence that the species is effective for erosion control.

What are Some Alternative Native Species to the Invasive Aliens in the Handbook?

The table below provides a list of alternative Virginia native plants with similar attributes to the invasive alien plants. These alternatives are offered as suggestions if the criteria listed above are met. Fact sheets for 30 invasive plant species and five brochures on using native plants for restoration and landscaping are available on DNH's website.

Invasive Alien Species	***Alternative Virginia Native***	
Common Name	*Common Name*	*Scientific Name*
Common Reed	Great bulrush	*Scripus lacustris*
	Common Cattail	*Typha latifolia*
Chinese lespedeza **Birdsfoot trefoil** **Orchard grass** **Redtop** **Weeping lovegrass**	Roundheaded bushclover	*Lespedeza capitata*
	Patridge pea	*Chamaecrista fasciculata*
	Butterflyweed	*Asclepias tuberosa*
	Joe-pye weed	*Eupatorium dubium*
	Black-eyed Susan	*Rudbeckia fulgida*
	Big blue stem	*Andropogon gerardii*
	Indian grass	*Sorghastrum nutans*
	Side oats grama	*Bouteloua curtipendula*
Crownvetch	Roundheaded bushclover	*Lespedeza capitata*
	Patridge pea	*Chamaecrista fasciculate*
	Big blue stem	*Andropogon gerardii*
	Little blue stem	*Schizachyrium scoparium*
	Indian grass	*Sorghastrum nutans*
	Switchgrass	*Panicum virgatum*
Tall fescue	Big blue stem	*Andropogon gerardii*
	Little blue stem	*Schizachyrium scoparium*
	Indian grass	*Sorghastrum nutans*
	Switchgrass	*Panicum virgatum*
	Broomsedge	*Andropogon virginicus*
	Deertongue	*Dichanthelium clandestinum*
	Side oats grama	*Bouteloua curtipendula*
	Canadian wildrye	*Elymus canadensis*
	Bottlebrush grass	*Elymus hystrix*
	Virginia wildrye	*Elymus virginicus*

Are There Other Considerations When Employing Alternative Native Plants?

Yes. The following potential issues should also be considered when employing alternative native plants:

- Always using a seed mix is desirable for two reasons:
  - Some natives take several seasons to fully establish, so a seed mix including some non-competing annual plant species is recommended
  - To prevent establishing a "monoculture" and encourage biodiversity, multiple natives species should be established on site when possible
- Some natives have new/unique maintenance requirements (weeding, mowing, herbicides, etc.)
- Adding compost to raise the organic content of the soil will greatly enhance the success of vegetation
- Always coordinate with and educate local government officials, property owners, and the citizenry about the benefits of natives – many natives don't produce lush green lawns, and are perceived as weeds

Who Must Approve Use of Alternative Native Plants?

Users should work with the local Native Plant Society chapter (www.vnps.org) or equivalent and the erosion and sediment control program authority to select appropriate native plant species. Note that the selection of plant species for vegetative stabilization **must always** be approved by the program authority as a part of the erosion and sediment control plan.

Native Plants for Landscaping and Site Reclamation

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Forbs/Herbs									
Boneset	*Eupatorium* spp.	1'-4'	4	4	4		4	4	reclamation, wildflower meadow
Butterfly weed	*Asclepias tuberosa*	1'-3'	4					4	reclamation, wildflower meadow
Common milkweed	*Asclepias syriaca*	1'-2'		4	4		4	4	reclamation, wildflower meadow
Goat's rue	*Tephrosia virginiana*	1'-2'	4	4				4	reclamation
Goldenrod	*Solidago* spp.	2'-6'	4	4	4		4	4	reclamation, wildflower meadow
Grass-leaf blazing star	*Liatris graminfolia*	1'-3'	4	4			4	4	reclamation, wildflower meadow
Maryland golden aster	*Chrysopsis mariana*	<1'	4	4			4	4	reclamation, wildflower meadow
Late purple aster	*Aster patens*	1'-4'	4	4			4	4	reclamation, wildflower meadow
New York aster	*Aster novi-belgii*	1'-4'		4	4		4	4	reclamation, wildflower meadow
Round-head bushclover	*Lespedeza capitata*	2'-4'	4					4	reclamation
Sunflower	*Helianthus* spp.	1'-2'	4	4			4	4	reclamation, wildflower meadow
Swamp milkweed	*Asclepias incarnata*	1'-2'			4		4	4	reclamation, wildflower meadow
Threadleaf coreopsis	*Coreopsis verticillata*	2'	4				4	4	reclamation, wildflower meadow
Wand-like bushclover	*Lespedeza intermedia*	1'-3'	4	4			4	4	reclamation
White heath aster	*Aster pilosus*		4					4	reclamation, wildflower meadow

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Wild bergamot	*Monarda fistulosa*	<1'-3'	4					4	reclamation, wildflower meadow
Wild indigo	*Baptisia tinctora*	3'-5'	4	4			4	4	reclamation, wildflower meadow
Grasses									
Broomsedge	*Andropogon virginicus*	1'-3'	4	4			4	4	nws grassland
Bushy broomsedge	*Andropogon glomeratus*	1.5' -5'		4	4		4	4	nws grassland
Switchgrass	*Panicum virgatum*	3'-5'	4	4	4		4	4	nws grassland
Little bluestem	*Schizachyrium scoparium*	2'-3'	4	4			4	4	nws grassland
Eastern gamma grass	*Tripsacum dactyloides*		4	4			4	4	nws grassland
Side-oats grama	*Bouteloua curtipendula*			4			4		nws grassland
Indian grass	*Sorghastrum nutans*	5'-6'	4	4			4	4	nws grassland
Shrubs									
Blueberry, highbush	*Vaccinium corymbosum*	2'-12'		4	4	4	4		riparian buffer
Blueberry, lowbush	*Vaccinium pallidum*	1'-1.5'	4	4		4	4		reclamation, wildlife
Buttonbush	*Cephalanthus occidentalis*	3'-7'			4	4	4		riparian buffer
Chokeberry, black	*Aronia melanocarpa*	3'-10'		4	4		4		riparian buffer
Chokeberry, red	*Aronia arbutifolia*	3'-10'	4	4	4		4	4	riparian buffer, reclamation
Dogwood, graystem	*Cornus racemosa*	10'-15'	4	4	4	4	4	4	riparian buffer, reclamation
Dogwood, silky	*Cornus amomum*	6'-10'		4	4		4		riparian buffer
Hazel alder	*Alnus serrulata*	6'-15'		4	4	4	4		riparian buffer
Hazelnut	*Corylus americana*	6'-10'		4	4		4	4	reclamation, wildlife
Indigobush	*Amorpha fruiticosa*	6'-15'	4	4	4			4	riparian buffer, reclamation
Inkberry	*Ilex glabrs*	2'-10'		4	4	4	4		riparian buffer, landscape
Mountain laurel	*Kalmia latifolia*	3'-10'	4	4		4	4		landscape
Serviceberry	*Amelanchier canadensis*	5'-15'		4					landscape, wildlife

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Swamp azalea	*Rhododendron viscosum*	3'-8'		4	4	4	4		riparian buffer
Sweet pepperbush	*Clethra alnifolia*	3'-8'		4	4	4	4	4	riparian buffer, landscape
Viburnum, arrowwood	*Viburnum dentatum*	4'-8'		4	4		4	4	riparian buffer, landscape
Viburnum, blackhaw	*Viburnum prunifolium*	8'-15'	4	4	4	4	4		landscape, reclamation
Virginia sweetspire	*Itea virginica*	3'-5'		4	4	4	4	4	riparian buffer, landscape
Wax myrtle	*Morella (Myrica) cerifera*	2'-6'		4	4		4	4	riparian buffer
Winterberry	*Ilex verticilatta*	4'-12'		4	4		4	4	riparian buffer
Small Trees									
Dogwood	*Cornus florida*	20'-30'		4			4	4	landscape
Hawthorn	*Crataegus* spp.	10'-20'		4			4	4	landscape
Sassafras	*Sassafras albidum*	20'-40'		4			4	4	landscape, reclamation
Serviceberry	*Amelanchier arboria*	15'-25'		4			4	4	landscape, wildlife
Sweetbay magnolia	*Magnolia virginiana*	15'-30'		4	4	4	4		riparian buffer, landscape
Medium to Large Trees									
America holly	*Ilex opaca*	40'-50'		4	4		4	4	landscape, wildlife
Ash, green	*Fraxinus americana*	50'-80'		4	4			4	riparian buffer, landscape
Ash, White	*Fraxinus pennsylvanica*	50'-60'		4	4			4	riparian buffer, landscape
Black locust	*Robinia pseudoacacia*	30'-50'	4	4			4	4	reclamation
Black willow	*Salix nigra*	30'-50'		4	4	4	4		riparian buffer
Blackgum	*Nyssa sylvatica*	50'-70'		4	4		4	4	riparian buffer, landscape, wildlife
Eastern Red Cedar	*Juniperus virginiana*	45'-65'	4	4	4		4	4	visual screen
Hackberry	*Celtis occidentalis*	40'-60'		4	4		4	4	riparian buffer, landscape
Oak, Black	*Quercus velutina*	65'-80'	4	4			4	4	landscape, reforestation
Oak, Cherrybark	*Quercus pagodaefolia*	70'-80'		4	4		4	4	landscape, reforestation,

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Oak, Chestnut	*Quercus prinus*	65'-80'	4				4	4	reforestation, reclamation
Oak, Pin	*Quercus palustris*	60'-70'		4	4		4	4	riparian buffer, landscape
Oak, Southern Red	*Quercus falcata*	70'-80'	4	4			4	4	landscape, reforestation
Oak, White	*Quercus alba*	70'-80'		4			4	4	landscape, reforestation
Oak, Willow	*Quercus phellos*	40'-60'	4	4	4		4	4	landscape, riparian buffer,
Persimmon	*Diospyros virginiana*	30'-40'	4	4			4	4	reclamation, wildlife
Pine Loblolly	*Pinus taeda*	80'-100'	4	4	4		4	4	landscape, reforestation
Pine, Shortleaf	*Pinus echinata*	80'-100'	4	4			4	4	reforestation
Pine, Virginia	*Pinus virginiana*	30'-50'	4	4			4	4	reclamation
Red Maple	*Acer rubrum*	50'-80'	4	4	4		4	4	riparian buffer, landscape
Red mulberry	*Morus rubra*	30'-40'		4			4	4	wildlife
River Birch	*Betula nigra*	40'-70'		4	4	4	4		riparian buffer, landscape
Sycamore	*Platanus occidentalis*	75'-120'		4	4		4	4	riparian buffer, landscape
Yellow Poplar	*Leriodendron tulipifera*	100'-150'		4			4	4	landscape, reforestation

Pruning Trees

Pruning is the most common tree maintenance procedure. Although forest trees grow quite well with only nature's pruning, landscape trees require a higher level of care to maintain their safety and aesthetics. Pruning should be done with an understanding of how the tree responds to each cut. Improper pruning can cause damage that will last for the life of the tree, or worse, it will shorten the tree's life.

Reasons for Pruning

Since each cut has the potential to change the growth of the tree, no branch should be removed without a reason. Common reasons for pruning are to remove dead branches, to remove crowded or rubbing limbs, and to eliminate hazards. Trees may also be pruned to increase light and air penetration to the inside of the tree's crown or to the landscape below. In most cases, mature trees are pruned as a corrective or preventative measure.

When to Prune

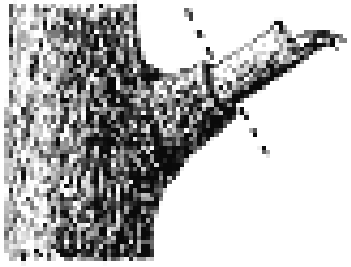
Most routine pruning to remove weak, diseased or dead limbs can be accomplished at any time during the year with little effect on the tree. As a rule, growth is maximized and wound closure is fastest if pruning takes place before the spring growth flush. Some trees, such as maples and birches, tend to "bleed" if pruned early in the spring. This may be unsightly, but is of little consequence to the tree.

A few tree diseases, such as oak wilt, can be spread when pruning wounds allow spores access into the tree. Susceptible trees should not be pruned during active transmission periods.

Heavy pruning just after the spring growth flush should be avoided. This is when trees have just expended a great deal of energy to produce foliage and early shoot growth. Removal of a large percentage of foliage at this time can stress the tree.

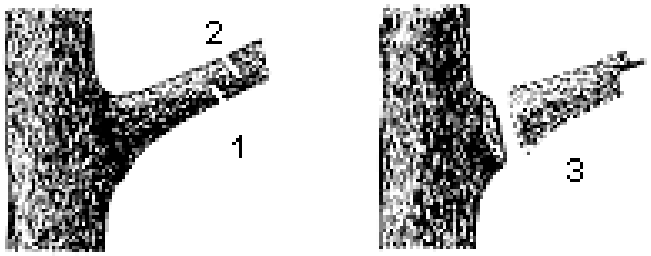
Making Proper Pruning Cuts to Mature Trees

Pruning cuts should be made just outside the branch collar. The branch collar contains trunk or parent branch tissue and should not be damaged or removed. If trunk collar has grown out on a dead limb to be removed, make the cut just beyond the collar. Do not cut the collar (see figure).



On a dead branch that has a collar of live wood, the final cut should be made just beyond the outer edge of the collar.

If a large limb is to be removed, its weight should first be reduced. This is done by making an undercut about 12-18 inches from the limb's point of attachment. A second cut is made from the top, directly above or a few inches further out on the limb. This removes the limb leaving the 12-18 inch stub. The stub is removed by cutting back to the branch collar. This technique reduces the possibility of tearing the bark



Use the 3-cut method to remove a large limb.

How Much Should be Pruned?

The amount of live tissue that should be removed depends on the tree size, species, and age, as well as the pruning objectives. Younger trees will tolerate the removal of a higher percentage of living tissue than mature trees. A common mistake is to remove too much inner foliage and small branches. It is important to maintain an even distribution of foliage along large limbs and in the lower portion of the crown. A widely accepted rule of thumb is never to remove more than one fourth of a tree's leaf bearing crown. In a mature tree, pruning even that much could have negative effects. Removing even a single, large-diameter limb can create a wound that the tree may not be able to close. The older and larger a tree becomes, the less energy it has in reserve to close wounds and defend against decay or insect attack. The pruning of large, mature trees is usually limited to the removal of dead or potentially hazardous limbs.

Wound Dressings

Wound dressings were once thought to accelerate wound closure, protect against insects and diseases, and reduce decay. However, research has shown that dressings do not reduce decay or speed closure, and rarely prevent insect or disease infestations. Most experts recommend that wound dressings not be used. If a dressing must be used for cosmetic purposes, then only a thin coating of a non-toxic material should be applied.

Newly Planted Trees

Pruning of newly planted trees should be limited to corrective pruning. Remove torn or broken branches. Save other pruning measures for the second or third year. The belief that trees should be pruned when planted to compensate for root loss is misguided. Trees need their leaves and shoot tips to provide food and the substances, which stimulate new root production. Unpruned trees establish faster, with a stronger root system than trees pruned at the time of planting.

(From International Society Arboriculture at *http://www.isa-arbor.com/consumer/pruning.html*)

New Tree Planting

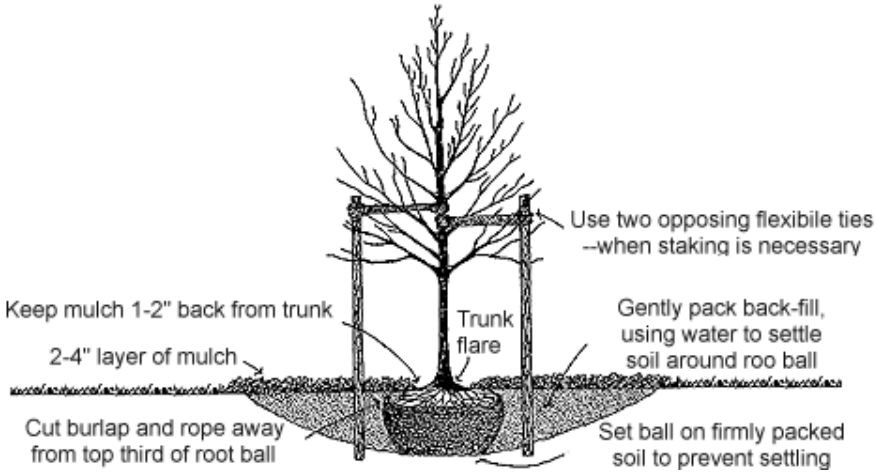
The ideal time to plant trees and shrubs is during the dormant season, in the fall after leafdrop or early spring before bud-break. Weather conditions are cool and allow plants to establish roots in the new location before spring rains and summer heat stimulate new top growth. However, trees properly cared for in the nursery or garden center, and given the appropriate care during transport to prevent damage, can be planted throughout the growing season. In either situation, proper handling during planting is essential to ensure a healthy future for new trees and shrubs. *Before you begin planting your tree, be sure you have had all underground utilities located prior to digging.*

If the tree you are planting is balled and burlapped, or bare rooted, it is important to understand that the tree's root system has been reduced by 90-95% of its original size during transplanting. As a result of the trauma caused by the digging process, trees will commonly exhibit what is known as **transplant shock.** Transplant shock is indicated by slow growth and reduced vigor following transplanting. Proper site preparation before and during planting, coupled with good follow up care will reduce the amount of time the plant experiences transplant shock and will allow the tree to quickly establish in its new location. Carefully follow eight simple steps and you can significantly reduce the stress placed on the plant at the time of planting.

1. **Dig a shallow, broad planting hole.** Make the hole wide, as much as three times the diameter of the root ball, but only as deep as the root ball. It is important to make the hole wide because the tree roots on the newly establishing tree must push through surrounding soil to establish. On most planting sites in new developments, the existing soils have been compacted and are unsuitable for healthy root growth. Breaking up the soil in a large area around the tree provides the newly emerging roots room to expand into loose soil to hasten establishment.

2. **Identify the trunk flare.** The trunk flare is where the roots spread at the base of the tree. This point should be partially visible after the tree has been planted (see diagram). If the trunk flare is not partially visible, you may have to remove some soil from the top of the root ball. Find it so you can determine how deep the hole needs to be for proper planting.

3. **Place the tree at the proper height.** Before placing the tree in the hole, check to see that the hole has been dug to the proper depth, and no more. The majority of the roots on the newly planted tree will develop in the top 12" of soil. If the tree is planted too deep, new roots will have difficulty developing due to a lack of oxygen. It is better to plant the tree a little high, 1-2" above the base of the trunk flare, than to plant it at or below the original growing level. This will allow for some settling (see diagram). To avoid damage when setting the tree in the hole, always lift the tree by the root ball, and never by the trunk.



4. **Straighten the tree in the hole.** Before you begin backfilling have someone view the tree from several directions to confirm the tree is straight. Once you begin backfilling it is difficult to reposition.

5. **Fill the hole, gently but firmly.** Fill the hole about 1/3 full and gently but firmly pack the soil around the base of the root ball. Then, if the tree is balled and burlapped, cut and remove the string and wire from around the trunk and top 1/3 of the root ball (see diagram). Be careful not to damage the trunk or roots in the process. Fill the remainder of the hole, taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. To avoid this problem, add the soil a few inches at a time and settle with water. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.

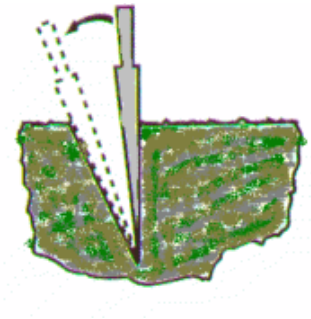
6. **Stake the tree, if necessary.** If the tree is grown and dug properly at the nursery, staking for support is not necessary in most home landscape situations. Studies have shown that trees will establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting. However, protective staking may be required on sites where lawn mower damage, vandalism or windy conditions are concerns. If staking is necessary for support, two stakes used in conjunction with a wide flexible tie material will hold the tree upright, provide flexibility, and minimize injury to the trunk (see diagram). Remove support staking and ties after the first year of growth. Leave protective staking in place as long as necessary.

7. **Mulch the base of the tree.** Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to hold moisture, protect against harsh soil temperatures, both hot and cold, and reduces competition from grass and weeds. Some good choices are leaf litter, pine straw, shredded bark, peat moss, or wood chips. A two to four inch layer is ideal. More that four inches may cause a problem with gas exchange. When placing mulch, care should be taken so that the actual trunk of the tree is not covered. This may cause decay of the living bark at the base of the tree. A mulch-free area, one to two inches wide at the base of the tree, is sufficient to avoid moist bark conditions and prevent decay.

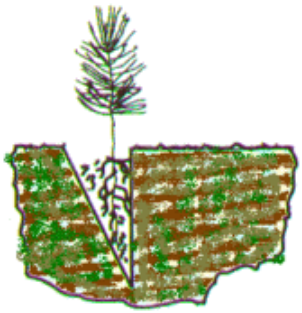
8. **Follow-up care.** Keep the soil moist but not soaked; overwatering will cause leaves to turn yellow or fall off. Water trees at least once a week, barring rain, and more frequently during hot weather. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less frequent watering. Other follow-up care may include minor pruning of branches damaged during the planting process. Prune sparingly immediately after planting, and wait to begin necessary corrective pruning until after a full season of growth in the new location.

(Taken from the International Society of Arboriculture at http://www.isa-arbor.com/consumer/planting.htm)

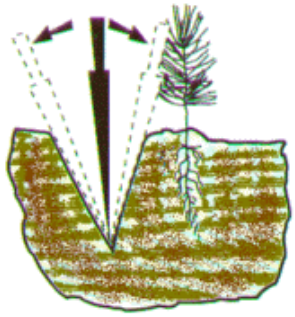
How to Plant with a Dibble Bar



1. Push the blade vertically into the soil then pull the handle toward you to open the hole.



2. Set the seedling 1 to 3 inches deeper than the nursery depth with the roots straight.



3. Push the blade into the soil just behind the planting hole then pull the handle back to close the bottom of the hole. Push the handle forward to close the top of the hole.

4. Pack the soil firmly with your heel.

(From South Carolina Forestry Commission at www.state.sc.us/forest/refplant.htm)

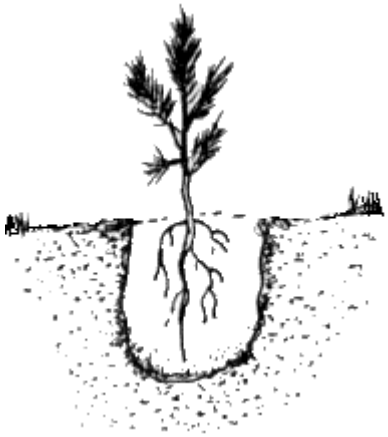
How to Plant Bare-root Trees

1. It is best to plant bare-root trees immediately, in order to keep the fragile roots from drying out. If you can't plant because of weather or soil conditions, store the trees in a cool place and keep the roots moist.

2. Unpack tree and soak in water 3 to 6 hours. Do not plant with packing materials attached to roots, and do not allow roots to dry out.

3. Dig a hole, wider than seems necessary, so the roots can spread without crowding. Remove any grass within a three-foot circular area. To aid root growth, turn soil in an area up to 3 feet in diameter.

4. Plant the tree at the same depth it stood in the nursery, without crowding the roots. Partially fill the hole, firming the soil around the lower roots. Do not add soil amendments.



5. Shovel in the remaining soil. It should be firmly, but not tightly packed with your heel. Construct a water-holding basin around the tree. Give the tree plenty of water.

6. After the water has soaked in, place a 2-inch deep protective mulch area 3 feet in diameter around the base of the tree (but not touching the trunk).

7. Water the tree generously every week or 10 days during the first year of establishment.

Recognizing Hazardous Trees

Hazardous Trees & Utility Lines. Trees that fall into utility lines have additional serious consequences. Not only can they injure people or property near the line, but hitting a line may cause power outages, surges, fires and other damage. Downed lines still conducting electricity are especially dangerous. A tree with a potential to fall into a utility line is a very serious situation.

Tree Hazard Checklist

Consider these questions . . .

1. Are there large dead branches in the tree?
2. Are there detached branches hanging in the tree?
3. Does the tree have cavities or rotten wood along the trunk or in major branches?
4. Are mushrooms present at the base of the tree?
5. Are there cracks or splits in the trunk or where branches are attached?
6. Have any branches fallen from the tree?
7. Have adjacent trees fallen over or died?
8. Has the trunk developed a strong lean?
9. Do many of the major branches arise from one point on the trunk?
10. Have the roots been broken off, injured or damaged by lowering the soil level, installing pavement, repairing sidewalks or digging trenches?
11. Has the site recently been changed by construction, raising the soil level or installing lawns?
12. Have the leaves prematurely developed an unusual color or size?
13. Have trees in adjacent wooded areas been removed?
14. Has the tree been topped or otherwise heavily pruned?

Managing Tree Hazards

One of these treatments may help make your tree safer. Reducing the risk associated with hazardous trees can take many forms.

1. **Prune the tree**. Remove the defective branches of the tree. Since in appropriate pruning may also weaken a tree,

2. **Provide routine care**. Mature trees need routine care in the form of water, fertilizer (in some cases), mulch and pruning as dictated by the season and their structure.

A number of treatments are best done by a Certified Arborist

1. **Cable and brace the tree.** Provide physical support for weak branches and stems to increase their strength and stability.

2. **Remove the tree.** Some hazardous trees are best removed. If possible, plant a new tree in an appropriate place as a replacement.

(From International Society of Arboriculture at *http://www.isa-arbor.com/consumer/hazards.html*)

APPENDIX E

Forest Management

Enclosure 1 Sample Prescribed Burn Plan
Enclosure 2 WPNSTA Forest Stand Records
Enclosure 3 Naval Weapons Station Yorktown Forest Stand Map
Enclosure 4 Cheatham Annex Forest Stand Map

YORKTOWN NAVAL WEAPONS STATION

PRESCRIBED BURN AND SMOKE MANAGEMENT PLAN

FY 2002

Prepared by: _____ **Date**: _____

Charles Wilson
Regional Forester, CNRMA Regional Environmental Group (Code 950)
(757) 887-7605

Reviewed by: _____ **Date**: _____

E. Brian Hostetter
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(757) 462-4571

Approved by: _____ **Date**: _____

K.L. Skudin, CAPT, USN
Commanding Officer, WPNSTA Yorktown
(757) 887-4141

Enclosures: (1) Strip-Heading Fire Technique
(2) Burn Area Locations and Descriptions
(3) Notification List
(4) Personnel/Materials List

Distribution:

Satisfactory to: _____
Public Works Officer, WPNSTA Yorktown

Satisfactory to: _____
Safety Department, WPNSTA Yorktown

Satisfactory to: _____
Fire Department, WPNSTA Yorktown

Satisfactory to: _____
Security Department, WPNSTA Yorktown

PRESCRIBED BURN PLAN

Definition: Prescribed or controlled burning is defined as the skillful application of fire to forest or grassland fuels, in a definite place, for a specific purpose, under exacting conditions, to achieve well-defined management objectives. In keeping with the management objectives of this plan, virtually all burning will be accomplished by the strip-headfiring technique described in enclosure (1). However, the burn boss may elect to use a different firing technique if conditions warrant. Also, the use of a backing fire may be necessary under certain conditions to minimize smoke impacts.

Purpose/Justification: The main objectives of the controlled burning described in this plan are to reduce hardwood competition in young thinned stands of Loblolly Pine, and to recycle nutrients tied up in accumulations of forest fuel (i.e. downed trees, saplings and underbrush) resulting from the thinning process. Secondary objectives are to improve wildlife habitat by encouraging the growth of herbaceous versus woody vegetation, to maintain an open canopy in the stand to stimulate vigorous herbaceous understory growth, and to reduce the potential for an uncontrollable fire by reducing fuel loads.

Time Frame/Season: This plan will be valid upon signature and will expire on 30 November 2002. Virginia State Code 10.0-1142-B outlaws open burning from February 15 until April 30 due to high fire danger. During this period the general public is prohibited from burning before 1600 hours. Federal facilities are exempt from this law for jurisdictional reasons.

Smoke Management Plan: The specific description of each burn area will give the atmospheric conditions required for burning of that area to occur. These conditions are designed to minimize the impacts to identified downwind smoke-sensitive receptors. Sensitive targets on or around WPNSTA Yorktown include Interstate 64, Rte. 238, Rte. 143, the Colonial Parkway, working production and storage facilities, housing and administrative areas, and the Branch Medical Clinic. Each burn area description includes the following details:

- Management objective for the burn.
- Required direction of surface winds.
- Required mixing height.
- Adjacent sensitive areas, if any.

Preferred wind direction will be indicated in the description of the burn areas. Weather conditions will be checked commencing 24 hours prior to proposed burning until the onset of burning by contacting local sources of weather information. Fire weather information will be obtained from the National Weather Service Fire Weather Forecast web page at http://www.srh.noaa.gov/data/WBC/FWF/WBCFWFAKQ.1.txt, and the Virginia Department of Forestry fire danger web page at http://www.state.vipnet.org/dof/fire/firedng.htm.

DESCRIPTION OF BURN AREAS

Locations and descriptions of proposed burn areas are shown in enclosure (2).

RESPONSIBILITIES

1. Regional Forester

a. Update prescribed burn plan as required.
b. Arrange for fire control breaks as necessary.
c. Act as burn boss; provide overall coordination prior to and during burn.
d. Notify chain-of command and other enclosure (3) personnel prior to burn.
e. Release burn crew from site at conclusion of burn.
f. Perform post-burn evaluation.

2. Regional Natural Resource Manager

a. Review prescribed burn plan.
b. Provide technical assistance.

3. LANTNAVFACENGCOM Forester

a. Review prescribed burn plan.
b. Provide technical assistance.

4. WPNSTA Yorktown Public Works Officer

a. Review prescribed burn plan.

5. WPNSTA Yorktown Safety Department

a. Review prescribed burn plan.

6. WPNSTA Yorktown Fire Department

a. Provide standby fire crew in case of emergency. Due to mission requirements, a standby fire crew will not always be available. No burning will be conducted unless sufficient Fire Department resources are available.
b. If requested by the Regional Forester, make hourly site inspections for three consecutive hours after burn crew personnel have secured the burn site.

7. WPNSTA Yorktown Security Department

a. Provide traffic control for emergencies and/or rerouting of traffic during unexpected wind conditions.

REQUIRED WEATHER CONDITIONS

The following conditions must be met before burning is initiated.

- No significant rainfall three to seven days prior to burning.
- Winds of 10 miles per hour or less with gusts no higher than 15 miles per hour.
- Relative humidity of 30 to 50 percent.
- Air temperature of 20 to 50 degrees Fahrenheit.
- Fine fuel moisture of 7 to 20 percent.
- Frontal system no less than four hours distant.
- Specific wind direction as required to direct smoke.

BURN PREPARATION

1. Notification - all concerned parties in enclosure (3) will receive notification and all necessary information concerning the proposed burn as soon as possible before the time of ignition. Weather is the primary controlling factor, and will generally limit notification time to less than one day prior to burning.
2. Establishment of fire control breaks is discussed in the individual burn area descriptions. Secondary firebreaks, consisting of roads, ditches, and mowed areas, are located around all burn areas and provide additional assurance against escape of the fire.
3. Personnel/materials – a list of work crew personnel and equipment needed to control the burn is attached as enclosure (4).
4. Day of burn procedures.
   a. Obtain current weather and fire weather forecasts.
   b. Notify all concerned parties listed on enclosure (3) prior to ignition.
   c. The burn boss will conduct a briefing covering the following areas:
   - Burn objectives.
   - Techniques to be used.
   - Safety concerns.
   - Burn area boundaries
   - Use of fire tools.
   - Chain of command – the natural resource staff, headed by the burn boss, gives direction to the work crew.

5. Burn completion – When all open flame within 25 feet of the burn area perimeter and all smoldering material is extinguished, and the burn has been completed to the satisfaction of the burn boss, the work crew will be released from the site. If requested by the burn boss, the WPNSTA Fire Department will make hourly site inspections for three consecutive hours after the burn boss has released the burn crew from the site.
6. Post-burn evaluation – each burn event will be evaluated with respect to the following questions:
   - Was the burn plan followed?
   - Were pre-burn preparations made?
   - Were conditions of weather, fuel, and fire behavior within prescribed limits?
   - Was the ignition conducted correctly?
   - Was the fire confined to the area planned for burning?
   - Were there any accidents?
   - Were the effects on soil, air, vegetation, water, and wildlife as predicted by the burn plan?
   - Were the burn objectives met?

EMERGENCY ACTION

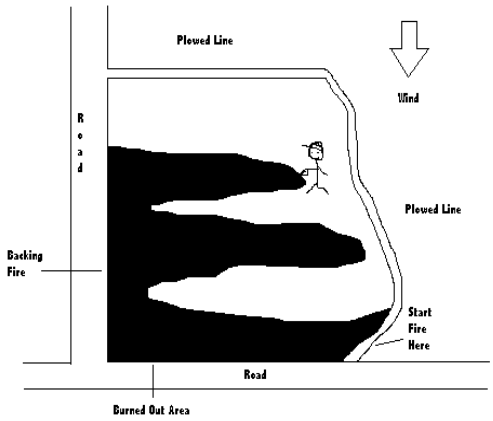
1. In the event of an emergency, these options are available and will be utilized as necessary by the burn boss and Fire Department personnel.
   a. Have Fire Department assist in extinguishing fire.
   b. Stop lighting new sections but let the existing fire continue to burn.
   c. Continue normal burning procedures.

2. In case of a fire escape that cannot be controlled by the burn crew and the WPNSTA Yorktown Fire Department, the following agencies may be contacted for assistance.
   a. York County Fire Department (757) 890-3600
   b. Virginia Department of Forestry (757) 253-4695
   c. Colonial National Historical Park Ranger Headquarters (757) 898-2425

"WATCH-OUT" SITUATIONS

IF ANY OF THE FOLLOWING CONDITIONS EXIST, THE BURN WILL BE HALTED AND EXISTING FIRE WILL BE EXTINGUISHED.

- Erratic fire behavior.
- Spot fires occur and are difficult to control.
- Wind shifts or other unforeseen weather conditions occur.
- Smoke does not disperse as predicted.
- A public road or other sensitive area is "smoked in".
- The burn does not comply with all applicable laws, regulations, and standards.
- Large fuels are igniting and burning and the fire therefore will not be secured before dark, which could lead to "smoking in" of sensitive areas.



STRIP HEADING FIRE

-

In strip-headfiring, a series of lines of fire are set progressively upwind of a firebreak in such a manner that no individual line of fire can develop to a high energy level before it reaches either a firebreak or another line of fire. A backing fire is generally used to secure the base line and the remainder of the area Is then treated with strip-heading fires. Strips are often set 35 to 100 feet apart. The desired flame length determines the distance between ignition lines. This distance can be varied within a fire to adjust for slight changes in topography, stand density, weather, or the type, amount, or distribution of fuel. Altering the angle of strip fire with the base line can compensate for minor wind direction changes. Treat major changes in fuel type separately. An effective method of reducing fire intensity is to use a series of spots or short one to two foot long strips instead of a solid line of fire. An added advantage of these short strips or spots is that driptorches will not have to be refilled as often. Strip-heading fires permit quick ignition and burnout, and provide for smoke dispersal under optimum conditions. However, higher intensities will occur wherever lines of fire burn together, increasing the likelihood of crown scorch.

Occasionally, on areas with light and even fuel distribution, a heading fire may be allowed to move over the entire area without stripping to better accomplish the objective(s). This method reduces the number of areas of increased fire intensity that occur each time two fires burn together. Caution – be sure the fire will not escape control. First set a backing fire along the downwind control line and allow it to burn out a strip wide enough to control the heading fire.

Factors associated with strip-heading fires

- Secure the downwind baseline before igniting a heading fire.
- Do not use in heavy roughs. Consider alternative techniques if fire-free interval exceeds three years.
- Winter use is best because cool weather (below 60 degrees Fahrenheit) helps avoid crown scorch.
- Use in medium to large sawtimber. Can be used in “flat” fuels such as hardwood leaves.
- Because fire movement is fast, large blocks can be burned.
- Can be used with high humidity (50-60%) and high fine-fuel moisture (20-25%).
- Needs just enough wind to give direction (1-2 mph in-stand).
- Few plow lines are needed.
- Can accommodate wind shifts up to about 45 degrees.
- Flame lengths increase whenever fire fronts converge, increasing possibility of crown scorch.
- A single torch person can progressively ignite strips.
- Do not force a burn on a marginal day at the low end of the prescription window. The fire may burn slowly until after the crew leaves then pick up intensity and escape.

Encl (1)

BURN PLAN
PERSONNEL TO BE NOTIFIED

1.	Commanding Officer, CAPT Skudin	(757) 887-4141
2.	WPNSTA Yorktown Fire Department	(757) 847-7871
3.	WPNSTA Yorktown Security Dispatch	(757) 887-4676
4.	Public Works Officer, CDR McGarrity	(757) 887-4636
5.	Public Affairs Officer	(757) 887-4939
6.	York County Fire Department	(757) 890-3600
7.	James City County Fire Department	(757) 220-0626
8.	Newport News Fire Department	(757) 926-8414
9.	Virginia Department of Forestry	(757) 253-4695
10.	Virginia DEQ, Tidewater Regional Office	(757) 518-2077
11.	Colonial National Historical Park (Chief Ranger)	(757) 898-2425

BURN PLAN
WORK CREW AND MATERIALS NEEDED

1. Burning work crew adequate to set and control the planned burn(s). Size and composition to be determined by the burn boss.
2. Fire tools (flappers, rakes, and shovels).
3. Drip torches.
4. Drip torch fuel mixture (1 part gasoline to 3 parts diesel fuel).
5. Burn Area maps and aerial photographs.
6. Water cooler and cups.
7. Copy of the Prescribed Burn Plan.

BURN AREA LOCATIONS AND DESCRIPTIONS

ATTACH LOCATION MAP HERE

Table 1. Compartment No. 1 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE CLASS	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	HP4	15	1924	109	14.5	94	88	
2	H4	102	1926	115	12.2	143	81	
3	P4	8	1954	93	17.6	55	87	
4	H4	34	1922	124	13.4	126	78	
5	PH4	36	1907	126	14.2	115	65	
6	PH4	18	1919	137	13.2	143	87	
7	H4	107	1928	115	13.0	125	84	
8	P1	6	1988	75	5.0	550	90	Cut, burned, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY91; drumchopped for thinning FY96
9	P2	19	1985	114	6.8	456	100	Drumchopped, burned; planted Lob. 8x8; Roundup FY85
10	H4	67	1926	128	14.4	113	81	
11	H4	88	1902	151	14.1	140	101	
12	HP4	43	1927	145	14.8	121	90	
13	HP4	18	1927	-	-	-	-	Outside fence
14	P1	8	1986	145	5.0	1100	95	Drumchopped, burned; planted Lob. 8x8 FY86; drumchopped for thinning FY96
15	PH1	2	1991	-	2.0	-	85	Cut FY90, natural regeneration, Arsenal FY93
16	H1	8	1993	-	2.0	-	85	Cut FY92, natural regeneration, chainsaw preparation; drumchopped for thinning FY95
17	P3	3	1957	188	8.2	518	68	
All	H1	8						
All	H4	398						
All	HP4	76						
All	P1	14						
All	P2	19						
All	P3	3						
All	P4	8						
All	PH1	2						
All	PH4	54						
All	All	582						Total Forested Acres

Table 1. Compartment No. 1 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE CLASS	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND*								
1		301						Industrial area
3		76						Explosive plants and handling areas
4		36						Explosive magazines
8		6						Roads, railroads, power lines
9		14						Recreation areas (grass); Wright Circle, Skeet Range
10		3						Landfills, dumps, borrow pits
12a		2						Freshwater marsh
12d		15						Saltwater marsh (outside fence)
13		28						Ponds; Roosevelt, Lee
14		20						Food plots
All		505						Total Nonforested Acres
All	All	1,051						TOTAL ACREAGE COMPARTMENT NO. 1

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 2. Compartment No. 2 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE CLASS	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P3	47	1960	100	10.1	178	101	
2	P4	28	1922	144	13.1	153	80	
3	H4	56	1932	170	14.0	160	102	
4	H4	34	1932	90	16.9	57	90	
5	H4	66	1927	127	15.1	103	82	
6	P2	39	1984	117	6.8	464	80	Rootraked, piled; planted Lob. 8x8; Roundup 9-85
7	P4	15	1914	153	15.7	114	79	
8	P2	6	1984	96	6.8	386	99	Drumchopped, burned; planted Lob. 8x8
9	H4	62	1915	104	13.4	105	86	
10	P3	11	1960	272	9.8	517	91	
11	P1	12	1984	125	5.0	911	90	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85
12	H4	49	1927	131	14.1	121	88	
13	P1	10	1984	64	5.0	725	100	Planted Lob. 8x8; Roundup 9-85
14	P1	9	1988	15	5.0	88	81	Cut, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY91; drumchopped for thinning FY96
15	H4	19	1901	147	13.0	159	100	
16	P4	4	1920	200	13.5	202	95	
17	HP4	37	1920	143	13.4	146	95	
18	P2	7	1984	105	7.1	382	110	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85
19	P1	6	1990	85	4.0	975	85	Cut FY89, natural regeneration, Arsenal FY93
20	H4	3	1927	160	13.5	161	102	
21	H1	5	1991	-	2.0	-	65	Cut FY90, natural regeneration
All	P1	37						
All	P2	52						
All	P3	58						
All	P4	47						
All	H1	5						
All	H4	289						
All	HP4	37						
All	All	525						Total Forested Acres

Table 2. Compartment No. 2 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE CLASS	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND*								
1		7						Industrial area
2		36						Housing area
3		60						Explosive plants and handling areas
4		21						Explosive magazines
8		8						Roads, railroads, power lines
9		68						Recreation areas (grass)
12a		16						Freshwater marsh; Hydraulic Fill
12b		18						Saltwater marsh
12c		74						Brackish creeks; Indianfield Creek
14		20						Food plots
15c		7						Small forested block; Golf Course
All		335						Total Nonforested Acres
All	All	827						TOTAL ACREAGE COMPARTMENT NO. 2

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 3. Compartment No. 3 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE CLASS	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	HP4	12	1919	143	13.7	138	87	
2	PH4	8	1938	148	13.9	141	88	
3	PH4	24	1924	139	14.9	115	103	
4	P1	5	1987	106	5.0	733	90	Cut, drumchopped, burned FY86; planted Lob. 8x8 FY87
5	HP4	31	1924	128	14.0	121	85	
6	P4	12	1929	151	16.4	103	96	
7	P1	7	1988	22	5.0	170	70	Cut, drumchopped FY87; planted Lob. 8x8 FY88, Arsenal FY91; drumchopped for thinning FY96
8	P2	20	1981	216	8.0	622	93	Drumchopped; planted Lob. 10x10; Roundup 9-82 and 9-85
9	H4	27	1899	97	11.7	130	85	
10	P1	9	1985	65	5.0	273	100	Drumchopped; planted Lob. 8x8; sprayed 1 gal. Garlon, rootraked, piled; replanted FY86 - 6x8, Velpar; replanted FY87, Roundup FY87
11	PH4	20	1899	134	15.7	99	86	
12	P4	15	1902	107	14.2	97	92	
13	P4	18	1930	140	13.7	138	97	
14	P2	6	1984	23	7.6	75	91	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85
15	P1	14	1986	138	5.0	508	110	Drumchopped, sprayed 1-gal. Garlon, burned; planted Lob. 6x8, Roundup FY87; Arsenal FY91
All	P1	35						
All	P2	26						
All	P4	45						
All	H4	27						
All	HP4	43						
All	PH4	52						
All	All	228						Total Forested Acres

Table 3. Compartment No. 3 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE CLASS	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND*								
3		181						Explosive plants and handling areas
8		7						Roads, railroads, power lines
9		28						Recreation areas (grass)
10		19						Landfills, dumps, borrow pits
12b		51						Saltwater marsh
12c		133						Brackish creeks
14		20						Food plots
All		439						Total Nonforested Acres
All	All	664						TOTAL ACREAGE COMPARTMENT NO. 3

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 4. Compartment No. 4 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	H4	37	1924	117	11.7	158	99	
2	H4	60	1920	136	13.9	129	78	
3	PH4	2	1916	170	11.5	235	78	
4	P2	35	1980	129	6.9	498	100	Drumchopped; planted Lob. 8x12; Roundup 9-82
5	H4	25	1920	103	13.4	106	84	
6	HP1	18	1987	-	2.0	-	90	Cut, drumchopped FY86; planted Lob. 8x8 FY87
7	P1	28	1984	148	4.0	1100	92	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85
8	P1	15	1990	25	4.0	212	87	Cut FY90, natural regeneration; Arsenal FY93; drumchopped for thinning FY96
9	HP1	1	1994	-	1.0	-	85	Cut (Southern Pine Beetle salvage) FY93, natural regeneration
All	P1	21						
All	P2	98						
All	P4	5						
All	PH4	39						
All	H4	67						
All	All	230						Total Forested Acres

Table 4. Compartment No.4 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFORESTED LAND								
4		4						Explosive magazines
12b		14						Saltwater marsh
14		2						Food plots
All		20						Total Nonforested Acres
All	All	250						TOTAL ACREAGE COMPARTMENT NO. 4

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 5. Compartment No. 5 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	PH4	9	1927	100	15.0	82	89	
2	HP4	27	1932	-	-	-	-	Outside fence
3	P1	14	1985	30	4.0	220	89	Drumchopped, burned; planted Lob. 8x8; Arsenal/Roundup FY89; drumchopped for thinning FY95
4	H4	26	1920	119	18.7	62	87	
5	P1	17	1987	38	5.0	158	80	Cut, drumchopped FY86; planted Lob. 8x8 FY87; Arsenal/Roundup FY89; drumchopped for thinning FY95
6	PH2	11	1984	45	7.0	167	90	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85; drumchopped for thinning FY96
7	H4	25	1902	156	12.2	193	102	
8	H4	25	1902	137	13.9	130	102	
9	H4	45	1897	115	13.4	117	100	
10	H4	79	1922	146	14.5	128	99	
11	P2	11	1980	120	7.2	425	109	Drumchopped, burned; planted Lob. 8x12
12	H4	19	1927	118	13.7	116	93	
13	HP4	42	1927	145	12.5	169	101	
14	HP4	70	1906	123	13.2	130	92	
15	P2	15	1984	77	6.9	297	109	Rootraked, piled; planted Lob. 8x8; Roundup 9-85
16	PH4	17	1926	140	14.2	128	93	
17	P1	23	1984	48	5.0	250	90	Drumchopped, burned; planted Lob. 8x8; drumchopped for thinning FY96
18	P4	16	1924	124	18.2	68	94	
20	P2	11	1988	76	5.0	380	80	Cut, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY91; drumchopped for thinning FY95
21	PH1	5	1993	-	3.0	-	50	Cut FY92, natural regeneration, chain saw preparation
All	P1	7						
All	P2	100						
All	P4	57						
All	PH4	183						

Table 5. Compartment No. 5 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
All	H4	169						
All	All	516						Total Forested Acres
NONFOREST LAND								
4		5						Explosive magazines
7		22						EOD Range
12d		22						Saltwater marsh (outside fence)
13		28						Ponds
14		1						Food plots
All		78						Total Nonforested Acres
All	All	594						TOTAL ACREAGE COMPARTMENT NO. 5

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 6. Compartment No. 6 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	PH4	29	1932	-	-	-	-	Outside fence
2	H4	156	1906	116	13.2	123	84	
3	HP4	30	1899	115	12.6	131	70	
4	HP4	17	1906	93	10.8	152	70	
5	P2	19	1980	108	6.5	472	95	Drumchopped; planted Lob. 8x12
6	P4	29	1933	120	13.7	118	100	
7	H4	41	1937	154	15.3	122	101	
8	HP4	20	1899	103	13.4	104	70	
9	P2	16	1981	92	7.1	332	106	Drumchopped; planted Lob. 10x10; replanted FY82
10	HP4	76	1927	111	12.2	137	92	
11	H4	45	1927	85	11.7	115	92	
12	P1	10	1984	110	5.0	885	89	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85; drumchopped for thinning FY96
13	P2	15	1986	89	6.9	344	68	Drumchopped, sprayed ½ gal. Garlon, burned; planted Lob. 8x8
14	P1	10	1984	40	5.0	250	100	Drumchopped, burned; planted Lob. 8x8; frumchopped for thinning FY96
15	P1	10	1990	70	4.0	480	80	Cut FY90, natural regeneration; Arsenal FY93; drumchopped for thinning FY96
All	P1	13						2
All	P2	96						
All	P4	28						
All	PH4	189						
All	H4	206						
All	All	532						Total Forested Acres
4		12						Explosive magazines
7		16						EOD Range
12d		63						Saltwater marsh (outside fence)

Table 6. Compartment No. 6 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
13		16						Ponds
14		3						Food plots
All		110						Total Nonforested Acres
All	All	642						TOTAL ACREAGE COMPARTMENT NO. 6

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 7. Compartment No. 7 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	H4	12	1932	-	-	-	-	Outside fence
2	HP4	25	1932	107	12.7	122	90	
3	PH4	17	1900	150	10.8	237	94	
4	PH4	7	1933	143	13.2	151	98	
5	P1	8	1986	80	5.0	314	90	Drumchopped, burned; planted Lob. 8x8 FY86
6	HP4	22	1975	82	9.8	155	90	Planted Lob. 8x8
7	H4	64	1923	99	11.1	146	90	
8	HP4	10	1914	100	9.5	201	90	Drumchopped; planted Lob. 8x12
9	P4	25	1930	136	13.4	140	90	
10	P2	17	1986	109	6.9	415	105	Drumchopped; planted Lob. 8x8; Roundup 9-85
11	H4	83	1875	77	19.0	39	100	
12	P1	38	1990	80	5.0	380	88	Drumchopped, burned; planted Lob. 8x8; sprayed 1 gal. Garlon; replanted FY86
13	H4	40	1924	117	12.7	133	85	
14	HP4	47	1924	137	14.2	124	100	
15	P1	16	1989	128	5.0	650	100	Drumchopped, burned; planted Lob. 8x8; Arsenal/Roundup FY89
16	PH4	9	1914	160	11.5	223	102	
17	P1	22	1992	120	5.0	880	90	Cut, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY91
18	PH1	3	1997	-	.05	1800	80	Cut FY92, natural regeneration, chain saw preparation
All	P1	4						
All	P2	97						
All	P4	71						
All	PH2	39						
All	PH4	73						
All	H4	198						
All	All	482						Total Forested Acres

Table 7. Compartment No. 7 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
4		7						Explosive magazines
7		1						Pistol Range
14		1						Food plots
All		9						Total Nonforested Acres
All	All	491						TOTAL ACREAGE COMPARTMENT NO. 7

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 8. Compartment No. 8 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P1	29	1984	91	5.0	660	81	Hdwd. Frilled 2,4-D; planted Lob. 10x10
2	PH4	18	1915	115	10.8	181	73	
3	P2	23	1981	103	6.5	453	78	Chipped; planted Lob. 8x12; Roundup 9-82
4	PH4	16	1937	127	11.6	175	82	
5	H4	27	1901	141	13.7	139	88	
6	PH1	37	1990	96	5.0	700	90	Drumchopped, burned; planted Lob. 8x8; drumchopped for thinning FY97
7	HP4	33	1904	79	10.3	135	66	
8	PH4	27	1910	114	11.3	165	87	
9	P4	19	1915	64	15.0	52	73	
All	P1	57						
All	P2	24						
All	P4	19						
All	PH4	95						
All	H4	22						
All	All	217						TOTAL ACREAGE COMPARTMENT NO. 8

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 9. Compartment No. 9 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	H4	40	1910	98	11.5	135	85	
2	PH4	65	1926	123	13.0	134	100	
3	P2	15	1986	78	6.4	354	90	Drumchopped; planted Lob. 8x8; Roundup 9-85
4	P2	27	1980	123	7.3	416	100	Seedtree; hdwd. frilled 2,4-D; Chopped reduce stocking FY83
5	H4	138	1892	109	14.2	99	90	
6	P2	18	1987	78	6.3	355	88	Drumchopped, burned; planted Lob. 8x8
7	PH1	20	1991	100	5.0	510	88	Cut, drumchopped FY86; planted Lob. 8x8 FY87; Roundup FY87; Arsenal FY89
All	P2	93						
All	P4	60						
All	PH4	158						
All	All	311						Total Forested Acres
NONFOREST LAND								
3		14						Explosive plants and handling areas
14		2						Food plots
All		16						Total Nonforested Acres
All	All	327						TOTAL ACREAGE COMPARTMENT NO. 9

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip ‘n’ saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 10. Compartment No. 10 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	PH3	36	-*	94	9.7	182	60	Seedtree, *uneven age 30-80
2	PH4	101	1921	128	12.4	154	94	
3	P2	14	1971	103	8.0	296	73	Seedtree
4	PH4	7	1927	91	14.5	80	62	
5	P1	11	1992	48	5.0	250	100	Cut, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY91; drumchopped for thinning FY95
6	H4	41	1900	128	12.6	148	75	
7	H4	14	1954	89	15.2	71	90	Uneven age cut
8	H4	37	1954	122	12.8	136	88	
9	H4	8	1955	147	12.6	169	85	
10	HP4	37	1872	144	13.5	147	87	
11	HP1	22	1997	-	0.5	-	65	Cut FY89, natural regeneration; Arsenal FY93; drumchopped for thinning FY95
All	P1	25						
All	P2	65						
All	PH4	187						
All	H2	18						
All	H4	39						
All	All	334						Total Forested Acres

Table 10. Compartment No. 10 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
2		129						Housing Area
3		18						Explosive plants and handling areas
6		10						Q-Area and thumb buffer
8		30						Roads, railroads, power lines
12a		3						Freshwater marsh
All		190						Total Nonforested Acres
All	All	524						TOTAL ACREAGE COMPARTMENT NO. 10

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 11. Compartment No. 11 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P1	16	1984	129	5.0	1128	93	Drumchopped, burned; planted Lob. 8x8
2	HP4	16	1907	106	16.7	70	85	
3	PH4	43	1927	129	11.9	167	96	
4	H4	100	1927	119	13.0	128	90	
5	P3	6	1957	123	9.0	279	85	
6	P2	13	1982	100	6.7	410	88	Drumchopped; planted Lob. 8x12
7	P4	19	1970	113	11.1	168	91	Direct seeded; chopped reduce stocking FY79
8	PH4	40	1891	142	13.8	136	93	
9	H4	46	1891	108	13.3	112	95	
10	PH2	16	1982	85	7.8	258	110	Seedtree; hdwd. frilled 2,4-D
11	P1	19	1988	22	5.0	120	87	Drumchopped, burned; planted Lob. 8x8; replanted FY86; drumchopped for thinning FY95
12	P1	20	1989	78	5.0	345	89	Drumchopped, burned; planted Lob. 8x8; Roundup FY87
13	P1	3	1997	-	2.0	146	90	Cut FY92, natural regeneration; drumchopped for thinning FY96
14	P4	6	1926	136	13.4	139	94	
All	P1	8						
All	P2	116						
All	P4	73						
All	PH4	16						
All	H4	137						
All	All	350						Total Forested Acres

Table 11. Compartment No. 11 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
1		17						Industrial Area
3		44						Explosive plants and handling areas
4		4						Explosive magazines
8		38.5						Roads, railroads, power lines
9		4						Recreation areas (grass)
11		6.5						Historical sites; Lee House
12a		1						Freshwater marsh; Lee Pond
14		3						Food plots
All		118						Total Nonforested Acres
All	All	468						TOTAL ACREAGE COMPARTMENT NO. 11

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 12. Compartment No. 12 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P1	21	1989	143	5.0	833	95	Drumchopped, burned; planted Lob. 8x8; Arsenal/Roundup FY89
2	HP4	16	1926	132	14.7	112	95	
3	PH4	18	1920	127	14.6	108	103	
4	H4	32	1910	121	13.7	118	90	Cut FY86; lost to construction - 9 acres
5	P1	21	1985	105	5.0	983	100	Drumchopped; planted Lob. 8x8; Roundup 9-85
6	P1	7	1988	18	4.0	144	58	Cut, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY91; drumchopped for thinning FY96
7	H4	32	1910	97	13.6	96	99	
8	H4	30	1927	117	15.1	94	108	
9	PH1	15	1992	-	2.0	1800	80	Cut, chain saw preparation FY88, natural regeneration
10	H4	74	1913	144	13.4	148	83	
11	P2	11	1982	100	6.7	412	100	Natural seed; hdwd. frilled Tordon 101
12	H4	36	1902	127	15.1	102	93	
13	P1	9	1989	100	5.0	392	95	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85
14	P2	10	1987	128	6.9	490	100	Drumchopped, burned; planted Lob. 8x8
15	P2	15	1987	93	6.4	416	70	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85 (8 acres)
16	HP1	7	1990	-	3.0	625	60	
All	P1	18						
All	P2	112						
All	P4	18						
All	PH4	237						
All	H4	26						
All	All	420						Total Forested Acres

Table 12. Compartment No. 12 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
3		39						Explosive plants and handling areas
4		100						Explosive magazines
8		23						Roads, railroads, power lines
11		9						Historical Area
12b		58						Saltwater marsh
All		229						Total Nonforested Acres
All	All	640						TOTAL ACREAGE COMPARTMENT NO. 12

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 13. Compartment No. 13 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	PH4	18	1924	148	12.8	165	97	
2	H4	67	1922	141	13.7	138	84	
3	H4	249	1919	113	13.1	121	90	
4	P1	16	1989	53	5.0	242	90	Drumchopped, burned; planted Lob. 8x8
5	PH4	15	1913	169	14.6	146	83	
6	P1	12	1986	78	5.0	575	91	Drumchopped, burned; planted Lob. 8x8; Roundup 9-85
7	P1	17	1991	29	5.0	325	65	Cut, drumchopped FY87; planted Lob. 8x8 FY88; Arsenal FY93; drumchopped for thinning FY95
8	PH1	19	1991	29	4.0	683	60	Cut, chain saw preparation FY88, natural regeneration
All	P1	24						
All	P2	58						
All	P4	14						
All	PH4	320						
All	All	416						Total Forested Acres

Table 13. Compartment No. 13 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
4		11						Explosive magazines
12b		52						Saltwater marsh
14		3						Food plots
All		68						Total Nonforested Acres
All	All	484						TOTAL ACREAGE COMPARTMENT NO. 13

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 14. Compartment No. 14 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P2	13	1985	109	7.1	392	110	Drumchopped; planted Lob. 8x8; Roundup 9-85
2	HP4	86	1915	98	12.8	110	99	
3	H4	109	1929	105	14.4	94	107	
4	P1	11	1989	32	5.0	137	89	Drumchopped, burned; planted Lob. 8x8; drumchopped for thinning FY96
5	P2	12	1987	83	6.5	359	90	Drumchopped; planted Lob. 8x8
6	PH4	42	1921	133	14.8	112	88	
7	H4	21	1915	91	11.7	123	86	Bottomland hdwd.
8	H4	51	1903	105	15.5	80	76	
9	PH4	24	1874	160	14.5	140	100	
10	H4	26	1927	115	11.7	153	98	
11	PH4	6	1927	116	12.6	133	98	
12	P1	10	1989	127	5.0	512	92	Drumchopped, burned; planted Lob. 8x8; replanted FY86
13	P1	17	1989	56	5.0	404	72	Drumchopped, burned; planted Lob. 8x8; drumchopped for thinning FY95
14	PH4	28	1909	141	13.6	140	79	
15	P1	12	1995	-	2.0	1133	85	Cut FY90; natural regeneration: drumchopped for thinning FY 95
All	P1	16						
All	P2	48						
All	P4	100						
All	PH1	14						
All	PH4	82						
All	H4	203						
All	All	463						Total Forested Acres

Table 14. Compartment No. 4 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
4		28						Explosive magazines
8		12						Roads, railroads, power lines
14		3						Food plots
All		43						Total Nonforested Acres
All	All	506						TOTAL ACREAGE COMPARTMENT NO. 14

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 15. Compartment No. 15 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	HP4	11	1930	151	12.7	172	93	
2	P1	22	1990	60	5.0	306	80	Drumchopped, burned; planted Lob. 8x8; drumchopped for thinning FY96
3	HP4	106	1907	98	12.3	119	80	
4	P1	17	1986	157	5.0	1000	90	Drumchopped; planted Lob. 8x8; Roundup 9-85
5	H4	10	1904	107	15.7	79	70	Bottomland Hdwd.
6	HP4	74	1900	96	12.8	108	70	
7	P1	13	1994	-	2.0	2000	90	
8	P1	17	1984	136	5.0	1000	70	Drumchopped; planted Lob. 8x8
9	P1	10	1990	102	4.0	1167	100	Drumchopped, sprayed ½ gal. Garlon, burned; planted Lob. 8x8
10	P1	16	1990	50	5.0	380	90	Cut, drumchopped FY86; planted Lob. 8x8 FY87
11	HP4	15	1882	116	12.9	127	90	
12	HP4	14	1895	104	12.1	130	90	
13	P1	16	1997	-	0.5	1066	80	Cut (Southern Pine Beetle salvage) FY93, natural regeneration
All	P1	12						
All	P2	94						
All	P4	13						
All	PH4	218						
All	H4	6						
All	All	343						Total Forested Acres

Table 15. Compartment No. 15 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
3		7						Explosive plants and handling areas; Truck Marshaling Yard
4		57						Explosive magazines
14		1						Food plots
All		65						Total Nonforested Acres
All	All	408						TOTAL ACREAGE COMPARTMENT NO. 15

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 16. Compartment No. 16 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	PH4	11	1949	73	12.3	88	92	3 acres replanted FY85 due to SPB
2	PH4	37	1897	119	12.1	150	80	
3	HP4	23	1924	114	12.5	134	85	
4	HP4	15	1906	107	15.8	78	80	
5	P4	9	1928	145	11.0	221	86	
6	P1	28	1985	131	5.0	650	90	Drumchopped; planted Lob. 10x10; Roundup 9-82
7	HP4	36	1909	153	14.1	142	89	
8	H4	48	1910	133	13.1	141	84	
9	H4	17	1926	102	17.5	61	88	
10	P1	18	1988	28	5.0	200	80	Drumchopped, burned; planted Lob. 8x8; drumchopped for thinning FY97
11	P1	9	1990	110	5.0	454	80	Drumchopped, burned; planted Lob. 8x8
12	P1	22	1989	106	4.0	1200	85	Drumchopped, burned; planted Lob. 8x8
13	P1	15	1989	-	2.0	2200	60	Cut, chain saw preparation FY88, natural regeneration
14	PH1	5	1993	-	2.0	2766	80	Cut, chain saw preparation FY88, natural regeneration
15	PH1	4	1996	-	1.0	1100	85	Cut FY92, natural regeneration, chain saw preparation
16	P1	10	1996	-	2.0	250	85	Cut FY92, natural regeneration, chain saw preparation; drumchopped for thinning FY96
17	P2	6	1977	127	7.1	459	99	
All	P1	39						
All	P2	76						

Table 16. Compartment No. 16 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
All	P3	16						
All	P4	12						
All	PH4	142						
All	H4	53						
All	All	338						Total Forested Acres
NONFOREST LAND								
3		16						Explosive plants and handling areas; Railroad Marshaling Yard
4		14						Explosive magazines
6		4						Q-Area buffer
8		22						Roads, railroads, power lines
10		2						Landfills, dumps, borrow pits; Dirt Storage
All		58						Total Nonforested Acres
All	All	396						TOTAL ACREAGE COMPARTMENT NO. 16

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 17. Compartment No. 17 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P2	6	1988	83	6.8	328	80	Drumchopped, burned; planted Lob. 8x8
2	P1	15	1985	178	5.0	1040	78	Drumchopped; planted Lob. 8x8; Roundup 9-85
3	HP4	21	1921	113	12.7	129	91	
4	PH4	10	1920	120	11.9	155	78	
5	H4	53	1901	107	13.3	112	97	Lost 5 acres to construction
6	PH4	28	1914	114	13.2	120	85	Lost 5 acres to construction
7	H4	15	1922	122	15.0	100	90	
8	H4	28	1915	107	10.7	171	78	Bottomland Hdwd.
9	P1	17	1991	-	3.0	1332	100	Drumchopped, burned; planted Lob. 8x8
11	HP4	46	1920	147	12.4	176	103	Lost 10 acres to construction
13	HP1	4	1991	-	4.0	1266	64	
14	P1	13	1989	35	5.0	160	99	Cut, drumchopped FY86; planted Lob. 8x8 FY87;Arsenal/Roundup FY89; drumchopped for thinning FY96
15	P1	5	1994	-	2.0	1166	85	Cut FY90, natural regeneration; drumchopped for thinning FY 95
All	P1	6						
All	P2	58						
All	P4	41						
All	PH4	60						
All	H4	80						
All	All	245						Total Forested Acres

Table 17. Compartment No. 17 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
3		3						Explosive plants and handling areas; X-Ray Facility
4		139						Explosive magazines
8		14						Roads, railroads, power lines
10		11						Landfills, dumps, borrow pits; Turkey Road Borrow Pit
11		3						Historical areas; Cemetery and Halfway House
15c		5						Other forested areas
All		175						Total Nonforested Acres
All	All	420						TOTAL ACREAGE COMPARTMENT NO. 17

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 18. Compartment No. 2 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P2	13	1984	113	6.7	456	109	Drumchopped; planted Lob. 8x8; Roundup 9-85
2	H4	8	1927	95	8.5	241	90	Bottomland Hdwd.
4	H4	86	1927	104	12.1	130	95	
7	H4	52	1935	121	11.0	182	91	
8	P1	28	1989	140	5.0	720	90	Drumchopped, burned; planted Lob. 8x8; sprayed 1 gal. Garlon-7ac; replanted FY86; drumchopped for thinning FY97
9	H4	41	1892	156	14.0	146	91	
10	H4	25	1930	147	13.0	160	94	
11	PH4	8	1930	140	13.7	136	95	
12	H4	5	1930	90	12.8	100	100	Bottomland hdwd.
13	P2	10	1983	88	6.5	382	87	Drumchopped; planted Lob. 8x12
14	H4	49	1917	92	13.7	90	92	
15	P2	10	1986	105	6.8	419	100	Drumchopped; planted Lob. 8x12
16	HP4	11	1904	100	12.8	112	88	
17	PH4	6	1925	113	12.3	138	78	
18	P1	9	1990	100	5.0	587	89	Cut, drumchopped FY86; planted Lob. 8x8 FY87; Roundup FY87
19	PH4	6	1917	113	11.1	170	85	
20	P1	3	1994	-	3.0	500	100	Cut FY90, natural regeneration; Arsenal FY93
All	P1	8						
All	P2	70						
All	P4	8						
All	PH4	139						
All	H4	137						
All	All	362						Total Forested Acres

Table 18. Compartment No. 18 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
4		45						Explosive magazines
8		3						Roads, railroads, power lines
12b		44						Saltwater marsh
12c		12						Brackish creeks
14		2						Food plots
15c		4						Other forested areas
All		110						Total Nonforested Acres
All	All	472						TOTAL ACREAGE COMPARTMENT NO. 18

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 19. Compartment No. 19 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P2	9	1984	108	7.7	335	81	Drumchopped; planted Lob. 8x12; Roundup 9-85
2	HP4	17	1901	132	13.6	131	73	
3	H4	58	1892	122	13.3	125	90	
4	H4	25	1927	0	-	-	49	Bottomland hdwd.
5	H4	27	1894	133	12.9	147	87	
6	H4	28	1927	137	14.2	124	91	
7	H4	18	1927	121	12.3	147	91	
8	H4	20	1892	92	17.5	55	94	
9	HP2	15	1987	-	5.0	460	50	Cut, drumchopped FY86; planted Lob. 8x8 FY87
10	H1	20	1998					Riparian buffer planting
11	P1	154	1999					
All	P1	154						
All	P2	9						
All	HP4	17						
All	H4	176						
All	HP2	15						
All	All	391						Total Forested Acres
NONFOREST LAND								
1		36						Industrial Area; Skiffes Creek Complex
4		2						Explosive magazines
5		48						Q-Area; Within fence
6		25						Q-Area buffer; Outside Q-fence

Table 19. Compartment No. 19 Forest Records and Inventory, WPNSTA (1999 Forest Inventory) (cont'd)

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
8		5						Roads, railroads, power lines
All		116						Total Nonforested Acres
All	All	507						TOTAL ACREAGE COMPARTMENT NO. 19

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory.

Table 20. Compartment No. 20 Forest Records and Inventory, WPNSTA (1999 Forest Inventory).

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
FOREST LAND								
1	P1	19	1990	40	5.0	200	90	Drumchopped, burned; planted Lob. 8x8; replanted FY86; drumchopped FY96; salvage cut from ice damage in FY99
2	P4	8	1927	143	11.7	190	73	
3	H4	10	1927	98	11.6	133	73	Drumchopped; planted Lob. 10x10
4	PH4	7	1910	164	12.8	182	63	
5	P1	18	1993	-	4.0	300	75	Cut, chain saw preparation FY88, natural regeneration; drumchopped for thinning FY95
6	HP4	29	1924	87	12.1	109	77	
7	HP4	24	1893	110	12.3	133	69	
8	P2	14	1974	100	6.9	382	81	Seedtree; hdwd. frilled Tordon 101
9	H4	6	1917	144	11.4	204	79	
10	P4	8	1941	170	14.5	148	92	
11	PH4	6	1956	127	9.1	278	77	
12	PH4	37	1928	129	13.1	138	69	
13	P1	19	1987	133	5.0	990	82	Drumchopped, burned; planted Lob. 8x8; replanted FY86
14	P1	17	1990	23	5.0	110	90	Drumchopped, sprayed ½ gal. Garlon, burned; planted Lob. 8x8; drumchopped for thinning FY97
All	P1	24						
All	P2	92						
All	P4	24						
All	PH4	113						
All	All	253						Total Forested Acres

Table 20. Compartment No. 20 Forest Records and Inventory, WPNSTA (1999 Forest Inventory). (cont'd))

STAND NO.	TYPE/ SIZE	ACRES	YEAR EST.	BA	DBH	TPA	SI	REMARKS
NONFOREST LAND								
1		57						Industrial Area; Halstead Road Storage Area
3		12						Explosive plants and handling areas; Transfer Depot
4		5						Explosive magazines
5		79						Thumb area; Within fence
6		27						Q-Area and thumb area buffer; Outside fence
8		29						Roads, railroads, power lines
15c		10						Small blocks of forested areas
All		219						Total Nonforested Acres
All	All	472						TOTAL ACREAGE COMPARTMENT NO. 20

Size Class
1 seedling/sapling <6 inches
2 pulpwood 6 to 10 inches and poor quality trees
3 chip 'n' saw 10 to 12 inches
4 sawtimber <12 inches

Forest Cover Type
H upland and bottomland hardwoods
HP hardwood-pine mix with 25%-75% hardwood
P 75% of stand covered with pines
PH pine-hardwood mix with 25%-75% pine

BA basal area
DBH diameter breast height
SI site index
TPA trees per acre

*Nonforest lands acreages were not updated in the 1999 forest inventory

APPENDIX F

Wildlife Management

Enclosure 1 WPNSTA Deer Harvest Data
Enclosure 2 Quail and Rabbit Survey Data
Enclosure 3 Wildlife Food Plot Table

Naval Weapons Station Yorktown White-Tailed Deer Harvest Data From 1997 - 2001.

Year	Age	Sex	# Harvested	% Spikes	Weight	# Points	Diameter	% Lactation	Spread	FDR	AARR-M	AARR-F
1997	0.5	Male	64		38					1.05		
1997	1.5	Male	67	36	70	3.7	17.6				60	
1997	2.5	Male	33		95	6.3	25.3					
1997	3.5	Male	10		104	7.2	34.3					
1997	4.5	Male	2									
1997	5.5	Male	0									
1997	0.5	Female	56		32							
1997	1.5	Female	42		59			62				37
1997	2.5	Female	33		62			91				
1997	3.5	Female	27		67			97				
1997	4.5	Female	5									
1997	5.5	Female	7									
1998	0.5	Male	36		37					0.93		
1998	1.5	Male	62	84	65	2.3	15.2				63	
1998	2.5	Male	22		79	5.4	21.8					
1998	3.5	Male	10		95	6.5	28.3					
1998	4.5	Male	3									
1998	5.5	Male	2									
1998	0.5	Female	29		33							
1998	1.5	Female	29		60			21				41
1998	2.5	Female	21		65			76				
1998	3.5	Female	14		67			80				
1998	4.5	Female	1									
1998	5.5	Female	5									
1999	0.5	Male	38		42					0.92		
1999	1.5	Male	55	63	68	2.9	16.1				60	
1999	2.5	Male	23		84	5.1	23					
1999	3.5	Male	9		100	6.6	27.9					
1999	4.5	Male	3									
1999	5.5	Male	1									
1999	0.5	Female	39		37							
1999	1.5	Female	26		61			32				31
1999	2.5	Female	29		66			93				
1999	3.5	Female	25		71			93				

Naval Weapons Station Yorktown White-Tailed Deer Harvest Data From 1997 - 2001 (continued).

Year	Age	Sex	# Harvested	% Spikes	Weight	# Points	Diameter	% Lactation	Spread	FDR	AARR-M	AARR-F
1999	4.5	Female	2									
1999	5.5	Female	3									
2000	0.5	Male	40		40					1.03		
2000	1.5	Male	64	58	71	2.9	16.7		7.5		65	
2000	2.5	Male	28		86	5.7	23.5		13			
2000	3.5	Male	6		99	7	29.5		15.9			
2000	4.5	Male										
2000	5.5	Male										
2000	0.5	Female	33		34							
2000	1.5	Female	26		63			46				37
2000	2.5	Female	23		68			78				
2000	3.5	Female	13		69			95				
2000	4.5	Female	6									
2000	5.5	Female	3									
2001	0.5	Male	33		41					0.98		
2001	1.5	Male	65	65	71	2.7	16.9		6.9		63	
2001	2.5	Male	25		84	5.7	23.3		12.7			
2001	3.5	Male	12		101	7.4	29.6		17.9			
2001	4.5	Male	2									
2001	5.5	Male	0									
2001	0.5	Female	22		37							
2001	1.5	Female	20		64			50				36
2001	2.5	Female	17		68			94				
2001	3.5	Female	11		70			100				
2001	4.5	Female	2									
2001	5.5	Female	6									

Age class 5.5 includes deer 5.5 years and greater.
Weiight is average dressed weight.
points is average number of antler points.
Diameter is average beam diameter at the base in mm.
Spread is average outside antler spread in inches.
FDR is the harvest of fawns per yearling and adult doe ratio.
AARR-M is the average annual reduction rate as a percent of yearling males in the antlered male harvest.
AARR-F is the average annual reduction rate as a percent of yearling females in the yearling and adult female harvest.

YORKTOWN

2002

2002-2003 DEER HARVEST (GUN) BY AREA

AREA	11/23	32B/22D	11/28	8B/9D	11/30	15B/17D	12/7	93B/72D 24B/17D	12/14	107B/87D 14B/15D	12/21	111B/98D 4B/11D	12/28	11CB/108D 5B/10D	AREA TOTAL	WITH BOW
1		4		2		2		0		1		0		2	11	15
2		2		2		5		2		10		3		0	24	29
3		0		2		4		4		3		3		4	20	23
4		0		1		0		6		0		0		0	7	8
5		9		1		1		5		2		0		0	18	18
6		6		0		0		4		0		0		0	10	13
7		1		0		0		1		1		0		0	3	5
8		1		0		3		1		0		0		0	5	5
9		2		0		2		0		3		0		0	7	7
10		4		2		5		2		0		3		0	16	18
11		4		0		1		1		2		0		5	13	13
12		4		1		1		1		1		4		0	12	12
13		4		0		2		3		0		1		2	12	12
14		4		1		0		0		0		0		0	5	5
15		3		2		0		1		0		0		0	6	6
16		4		2		0		1		2		0		0	9	9
17		0		0		4		7		1		0		0	12	13
18		2		1		2		2		3		1		2	13	13
GUN TOTAL		54		17		32		41		29		15		15	203	
PLUS BOW (21)		75		92		124		165		194		209		224		

2002

YORKTOWN
2002 - 2003 DEER HARVEST (BOW)
BY AREA

	10/5 2B/1D	10/12 1B/1D	10/14 1D	10/19 2B/1D	10/26 3B	11/2 1B/2D	11/9 5/B	11/11 NO DEER	11/16 1D	1AB/1D TOTAL
1		1		1	1	1				4
2	2	1		1		1				5
3			1			1	1			3
4	1									1
5										0
6					1		1		1	3
7				1			1			2
8										0
9										0
10					1		1			2
11										0
12										0
13										0
14										0
15										0
16										0
17							1			1
18										0
TOTAL	3	2	1	3	3	3	5	0	1	21

CAX

2003 - 2004 DEER HARVEST

COMBINED BOW & GUN

2003

BOW	B	D	GUN	B	D
10-4	0	0	11-15	5	2
10-8	0	1	11-19	3	0
10-11	0	0	11-22	3	3
10-15	1	0	11-26	0	0
10-18	0	0	11-29	2	0
10-22	0	1	12-3	5	1
10-25	0	0	12-6	2	4
10-29	0	0	12-10	3	0
11-1	1	0	12-13	3	0
11-5	0	0	12-17	0	0
11-8	2	0	12-20	0	0
11-12	0	0	12-24	0	0
TOTAL	4	2	12-27	1	0
			TOTAL	27	10

TOTAL DEER 43

TOTAL BUCKS 31 72%

TOTAL DOES 12 28%

YORKTOWN
2003 - 2004 DEER HARVEST (GUN) BY AREA

2003

BUCKS - 143 61%
DOES - 92 39%

AREA	11/15 41B/14D	11/22 32B/13D	11/27 14B/10D	11/29 14B/10D	12/6 9B/11D	12/13 6B/5D	12/20 12B/12D	12/27 15B/17D	AREA TOTAL	WITH BOW
1	5	6	3	2	0	0	2	2	20	20
2	7	5	0	7	0	1	1	5	26	28
3	0	5	1	4	4	0	8	2	24/69	26/73
4	5	4	2	1	7	1	2	0	22	22
5	2	1		1	0	2	2	5	20	20
6	4	2	1	1	6	0	2	1	17	20
7	1	2	0	0	0	0	0	0	3	3
8	0	2	2	0	0	0	0	0	4	4
9	1	3	1	1	0	0	0	0	6	6
16	2	3	0	2	0	0	0	2	9	12
11	2	5	0	1	0	0	2	2	12	12
12	9	0	0	0	1	5	1	4	20	20
13	2	1	3	1	0	1	0	2	10	11
14	1	1	1	0	0	1	0	0	4	4
15	4	1	0	0	0	0	0	0	5	5
16	5	0	0	2	0	0	0	4	11	11
17	3	4	2	1	2	0	3	2	17	17
18	2	0	1	0	0	0	1	2	6	6
GUN TOTAL	55	45	24	24	20	11	24	33	236	247
VS BOW	66	111	135	159	179	190	214	247		

2003

YORKTOWN
2003-2004 DEER HARVEST (BOW)
BY AREA

AREA	10/4 1B	10/11 1D	10/13 1D	10/18	10/25	11/1 1B/1D	11/8 4B	11/11 2B	88/30
1									0
2	1						1		2
3		1					1		2
4									0
5									0
6						1	1	1	3
7									0
8									0
9									0
10			1				1	1	3
11									0
12									0
13						1			1
14									0
15									0
16									0
17									0
18									0
TOTAL	1	1	1	0	0	2	4	2	11

CAX
2004 - 2005 DEER HARVEST
COMBINED BOW & GUN

2004

BOW	B	D
10-2	0	0
10-9	1	0
10-11	0	0
10-16	0	1
10-23	0	0
10-30	0	0
11-6	1	0
11-11	0	0
Total	2	1

GUN	B	D	
11-13	14	1	15
11-20	1	1	2
11-25	2	1	3
11-27	4	2	6
12-04	6	4	10
12-11	8	4	12
12-18	3	1	4
	38	14	52

Total deer 55

	#	%
Total bucks	40	73
Total does	15	27

2004

YORKTOWN
2004-2005 DEER HARVEST (BOW)
BY AREA

AREA	10/2 2B	10/9 1B	10/11 1D	10/16	10/23 3B 1D	10/30 1B	11/6 3B	11/11 1D	10B / 3B
1	1								1
2			1						1
3									0
4	1								1
5									0
6									0
7									0
8									0
9							1		1
10		1				1		1	3
11									0
12									0
13									0
14									0
15									0
16							2		2
17					4				4
18									0
Total	2	1	1	0	4	1	3	1	13

2004

YORKTOWN
2004 - 2005 DEER HARVEST (GUN) BY AREA

AREA	11/13 37B 12D	11/20 23B 9D	11/25 12B 6D	11/27 22B 17D	12/04 20B 21B.	12/11 12B 13D	12/18 18B 17D	AREA TOTAL	WITH BOW
1	6	4	2	3	0	1	2	18	19
2	8	3	5	7	6	4	7	40	41
3	1	0	1	1	4	2	2	11	11
4	2	1	1	2	3	1	0	10	11
5	2	7	1	5	3	3	3	24	24
6	1	2	0	0	3	1	0	7	7
7	2	1	0	0	0	0	0	3	3
8	1	0	0	2	2	2	0	7	7
9	2	1	1	1	1	0	3	9	10
10	5	2	2	4	1	1	3	18	21
11	1	1	0	0	5	1	2	10	10
12	5	3	1	3	6	0	4	22	22
13	1	1	2	3	3	1	0	11	11
14	4	0	0	2	1	0	0	7	7
15	1	1	0	0	1	0	2	5	5
16	0	1	0	0	1	5	0	7	9
17	5	3	1	4	1	2	6	22	26
18	2	1	1	2	0	1	1	8	8
	49	32	18	39	41	25	35	239	252
Plus Bow	62	94	112	151	192	217	252		

		#	%
Total (Gun+Bow)	Bucks	154	61
	Does	98	39

2005

2005-2006 YKT BOW DEER

	B	D	TOTAL
10/1	· 1	0	1
10/8	·· 2	0	2
10/10	· 1	∴ 3	4
10/15	· 1	·· 2	3
10/22	· 1	·· 2	3
10/29	·· 2	· 1	3
11/05	· 1	0	1
11/11	∴ 4	· 1	5
11/12	· 1	0	1
	14	9	23

2005

2005-2006 Season YKt Gun Deer

AREA	11/19 (31B 14D)	11/24 (14B 7D)	11/26 (14B 7D)	12/3 (12B 14D)	12/10 (13B 16D)	12/17 (15B 17D)	99B 75D TOTA
1	3	4	2	0	4	2	15
2	4	4	5	5	3	10	31
3	1	3	2	1	1	2	10
4	2	0	2	1	2	3	10
5	5	4	0	3	2	1	15
6	3	1	0	0	2	0	6
7	4	0	1	0	1	0	6
8	3	0	2	0	0	0	5
9	0	2	0	0	2	0	4
10	4	1	0	2	2	7	16
11	1	0	1	2	1	0	5
12	6	0	0	0	6	0	12
13	0	0	1	0	0	0	1
14	2	0	2	3	0	4	11
15	1	0	1	1	0	0	3
16	2	0	0	2	2	1	7
17	2	0	0	6	0	2	10
18	2	2	2	0	1	0	7
TOTAL	45	21	21	26	29	32	
TOTAL WITH BOW (23)	68	89	110	136	165	197	

TOTAL BY SEX WITH BOW ADDED — 113 buck 57% of harvest; 84 Doe 43%

2005

2005 - 2006 SEASON
CAX BOW DEER

	B	D	TOTAL
10/01	·· 2	· 1	3
10/8		· 1	1
10/15	· 1		1
10/29	· 1	∴ 3	4
11/05	· 1		1
11/11	·· 2		2
11/12	· 1		1
	8buck	5doe	13 TOTAL

WITH GUN	(17) 25	(23) 28	53 Total

2005

2005 - 2006 SEASON

CAX GUN DEER

	B	D	TOTAL
11/19	⁙ 6	⁘ 3	9
11/24	⁘ 3	⁖ 2	5
11/26	⁖ 2	⁙ 4	6
12/03	⁖ 2	⁙ 6	8
12/10	⁘ 3	⁘ 3	6
12/17	⁚ 1	⁛ 5	6
	17 buck	23 doe	40
WITH BOW	(8) 25	(5) 28	53

2006

Yorktown Naval Weapons Station Harvest Data 2006/2007 Season

	DATE	0-M	0-F	1-M	1-F	2-M	2-F	3-M	3-F	4-M	4-F	5-M	5-F	6-M	6-F	7-M	8-F	DAILEY TOTAL	WEATHER
	10/7/2006	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	STORM 7" Rain
	10/9/2006	0	0	1	2	0	0	0	1	0	1	0	0	0	0	0	0	5	CLEAR 70-80
ARCHERY	10/14/2006	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	CLEAR 60-70
	10/21/2006	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	3	CLEAR 45-60
	10/28/2006	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	AM RAIN-PM PC 65
	11/4/2006	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	5	35-55 CLEAR
	11/10/2006	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	55-75 CLEAR
	11/11/2006	0	1	0	1	0	1	0	2	0	0	0	0	0	0	0	0	5	60-75 CLEAR
ARCHERY TOTAL AGE/SEX		**4**	**3**	**8**	**4**	**4**	**1**	**1**	**3**	**0**	**1**	**0**	**0**	**0**	**0**			**29**	**ARCHERY TOTAL**
	11/18/2006	11	8	17	6	12	7	6	4	2	4	1	0	0	1	0	0	79	40-55 CLEAR
	11/23/2006	3	1	2	1	2	0	1	0	0	0	0	0	1	0	0	0	11	RAIN WINDY
SHOTGUN	11/25/2006	6	4	4	2	5	3	2	4	0	2	0	0	0	0	1	0	33	35-55 CLEAR
	12/2/2006	4	5	3	4	3	4	0	2	1	1	0	0	0	0	0	1	28	45-55 CLEAR
	12/9/2006	4	5	5	3	2	4	3	5	0	1	0	2	0	0	0	0	34	20-40 CLEAR
	12/16/2006	6	3	9	4	6	5	1	2	1	2	0	0	0	0	0	0	39	40-60 CLEAR
	12/23/2006	2	4	0	4	2	5	0	1	0	1	0	1	0	0	0	0	20	45-60 LT RAIN
SHOTGUN TOTAL AGE/SEX		**36**	**30**	**40**	**24**	**32**	**28**	**13**	**18**	**4**	**11**	**1**	**3**	**1**	**1**	**1**	**1**	**244**	**SHOTGUN TOTAL**
SEASON TOTAL AGE/SEX		**40**	**33**	**48**	**28**	**36**	**29**	**14**	**21**	**4**	**12**	**1**	**3**	**1**	**1**	**1**	**1**	**273**	**SEASON TOTAL**

TOTAL MALE (BUCK)	**145**				**PERCENT OF HARVEST**						**53**								
TOTAL FEMALE (DOE)	**128**										**47**								
TOTAL MALE CAX/NWS	**182**																		
TOTAL FEMALE CAX/NWS	**156**																		
TOTAL HARVEST CAX/NWS	**338**																		

2006

Cheatham Annex Harvest Data 2006/2007 Season

	DATE	0-M	0-F	1-M	1-F	2-M	2-F	3-M	3-F	4-M	4-F	5-M	5-F	6-M	6-F	7-M	8-F	DAILEY TOTAL	WEATHER
	10/7/2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	STORM 7" Rain
	10/9/2006	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	4	CLEAR 70-80
ARCHERY	10/14/2006	0	1	0	1	0	0	1	1	0	0	1	0	0	0	0	0	5	CLEAR 60-70
	10/21/2006	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	4	CLEAR 45-60
	10/28/2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AM RAIN-PM PC 65
	11/4/2006	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	3	35-55 CLEAR
	11/11/2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60-75 CLEAR
ARCHERY TOTAL AGE/SEX		**0**	**2**	**3**	**1**	**2**	**1**	**4**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**16**	**ARCHERY TOTAL**
	11/18/2006	2	1	0	0	1	0	2	0	1	0	0	1	0	0	0	0	8	40-55 CLEAR
	11/23/2006	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	4	RAIN WINDY
SHOTGUN	11/25/2006	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	4	35-55 CLEAR
	12/2/2006	1	1	2	1	0	2	1	0	0	0	0	1	0	0	0	0	9	40-55 CLEAR
	12/9/2006	3	0	0	2	1	0	0	2	0	0	0	0	0	1	0	0	9	20-40 CLEAR
	12/16/2006	1	0	1	0	1	3	2	1	0	1	0	0	0	0	0	0	10	40-60 CLEAR
	12/23/2006	0	2	0	1	0	0	0	2	0	0	0	0	0	0	0	0	5	45-60 LT RAIN
SHOTGUN TOTAL AGE/SEX		**9**	**5**	**6**	**4**	**5**	**5**	**5**	**5**	**1**	**1**	**0**	**2**	**0**	**1**	**0**	**0**	**49**	**SHOTGUN TOTAL**
SEASON TOTAL AGE/SEX		**9**	**7**	**9**	**5**	**7**	**6**	**9**	**6**	**1**	**1**	**2**	**2**	**0**	**1**	**0**	**0**	**65**	**SEASON TOTAL**
TOTAL MALE (BUCK)		**37**																	
TOTAL FEMALE (DOE)		**28**																	

2007

Cheatham Annex Harvest Data 2006/2007 Season																		
	DATE	0-M	0-F	1-M	1-F	2-M	2-F	3-M	3-F	4-M	4-F	5-M	5-F	6-M	6-F	7-F	8-F	DAILEY TOTAL	WEATHER
	10/6/2007	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	
	10/8/2007	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
ARCHERY	10/13/2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	10/20/2007	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	
	10/27/2007	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	
	11/3/2007	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3	
	11/10/2007	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	11/12/2007	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3	
ARCHERY TOTAL AGE/SEX		**1**	**1**	**3**	**1**	**4**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**ARCHERY TOTAL**
	11/17/2007	0	0	2	1	1	2	0	0	0	0	0	1	0	0	0	0	7	
	11/22/2007	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	
SHOTGUN	11/24/2007	3	0	1	1	0	0	3	0	0	0	0	0	0	0	0	0	8	
	12/1/2007	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3	
	12/8/2007	3	1	0	0	2	0	1	0	0	0	1	0	0	0	0	0	8	
	12/15/2007	3	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	7	
	12/22/2007	2	0	2	0	2	1	1	2	0	0	0	1	0	0	0	1	12	
SHOTGUN TOTAL AGE/SEX		**11**	**1**	**7**	**2**	**8**	**4**	**5**	**4**	**0**	**0**	**1**	**2**	**0**	**0**	**0**	**1**	**46**	**SHOTGUN TOTAL**
SEASON TOTAL AGE/SEX		**12**	**2**	**10**	**3**	**12**	**5**	**5**	**5**	**0**	**0**	**1**	**2**	**0**	**0**	**0**	**1**	**58**	**SEASON TOTAL**
TOTAL MALE (BUCK) CAX		**40**		**PERCENT OF HARVEST**							69%								
TOTAL FEMALE (DOE) CAX		**18**									31%								

2007

Yorktown Naval Weapons Station Harvest Data 2006/2007 Season																		
DATE	0-M	0-F	1-M	1-F	2-M	2-F	3-M	3-F	4-M	4-F	5-M	5-F	6-M	6-F	7-F	8-F	DAILEY TOTAL	WEATHER
10/6/2007	2					1								1			4	
10/8/2007	1	1		1		1		1									5	
ARCHERY 10/13/2007	3			1	1		1										6	
10/20/2007		1	3			1											5	
10/27/2007		2	1														3	
11/3/2007					1												1	
11/10/2007	1											1					2	
11/12/2007		1	2		1												4	
ARCHERY TOTAL AGE/SEX	**7**	**5**	**6**	**2**	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**			**30**	**ARCHERY TOTAL**
11/17/2007	9	5	8	6	5	3	9	3	1				1				50	
11/22/2007	2	1	5		1		2	2		1							14	
SHOTGUN 11/24/2007	3	7	3	1	3		1		1	1							20	
12/1/2007	6	4	5	2	1		3			1		1		1			24	
12/8/2007	10	6	3	8	5	4	1	4		1		1					43	
12/15/2007	3	5	3	3	3	2	2	4		1							26	
12/22/2007	4	7	5	4	3			4	2	2					1		32	
12/29/2007			1														1	
1/3/2008	1		1	1		1		1									5	
SHOTGUN TOTAL AGE/SEX	**38**	**35**	**34**	**25**	**21**	**10**	**18**	**18**	**4**	**7**	**0**	**2**	**1**	**1**	**1**	**0**	**215**	**SHOTGUN TOTAL**
SEASON TOTAL AGE/SEX	**45**	**40**	**40**	**27**	**24**	**13**	**19**	**19**	**4**	**7**	**0**	**3**	**1**	**2**	**1**	**0**	**245**	**SEASON TOTAL**
TOTAL MALE (BUCK) NWS	**133**		**PERCENT OF HARVEST**							54%								
TOTAL FEMALE (DOE) NWS	**112**									46%								
TOTAL MALE CAX/NWS	**173**		**PERCENT OF HARVEST**							57%								
TOTAL FEMALE CAX/NWS	**130**									43%								
TOTAL HARVEST CAX/NWS	**303**																	

2007

YORKTOWN % BUCK/DOE HARVEST BY AREA

AREA	BUCK	% BUCK	DOE	% DOE	TOTAL	% OF TOTAL
1	13	9.77%	5	4.46%	18	7.35%
2	30	22.56%	30	26.79%	60	24.49%
3	8	6.02%	10	8.93%	18	7.35%
4	3	2.26%	4	3.57%	7	2.86%
5	10	7.52%	9	8.04%	19	7.76%
6	6	4.51%	5	4.46%	11	4.49%
7	1	0.75%	1	0.89%	2	0.82%
8	3	2.26%	1	0.89%	4	1.63%
9	4	3.01%	4	3.57%	8	3.27%
10	12	9.02%	8	7.14%	20	8.16%
11A	6	4.51%	4	3.57%	10	4.08%
11B	3	2.26%	1	0.89%	4	1.63%
12	11	8.27%	9	8.04%	20	8.16%
13	8	6.02%	7	6.25%	15	6.12%
14	4	3.01%	4	3.57%	8	3.27%
15	2	1.50%	0	0.00%	2	0.82%
16	3	2.26%	1	0.89%	4	1.63%
17	1	0.75%	3	2.68%	4	1.63%
18	5	3.76%	6	5.36%	11	4.49%
TOTAL	133	54.29%	112	45.71%	245	

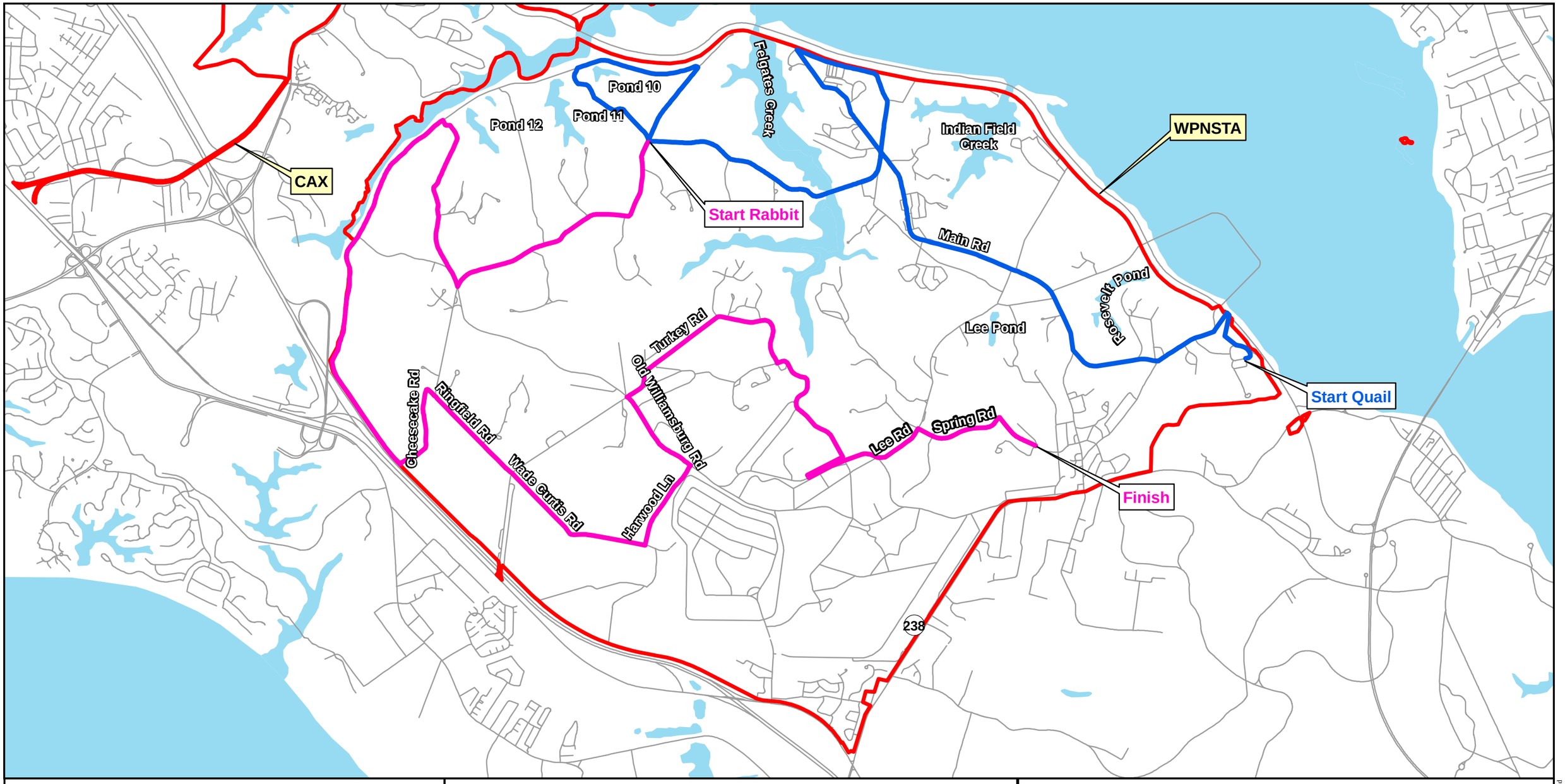
2007

CHEATHAM ANNEX BY AREA						
AREA	BUCK	DOE	TOTAL			
[redacted]				[redacted]	BUCK	DOE
					7	4
				[redacted]	BUCK	DOE
					22	11
				[redacted]	BUCK	DOE
					11	3
TOTAL	40	18	58		40	18

Cheatham Annex Harvest Data 2008/2009 Season																		
DATE	**0-M**	**0-F**	**1-M**	**1-F**	**2-M**	**2-F**	**3-M**	**3-F**	**4-M**	**4-F**	**5-M**	**5-F**	**6-M**	**6-F**	**7-F**	**8-F**	**DAILEY TOTAL**	
10/4/2008			3		1	1											5	
10/11/2008							1										1	
ARCHERY 10/13/2008		1		1		1											3	
10/18/2008			1			2											3	
10/25/2008																	0	
11/1/2008			1	1													2	
11/8/2008			1	2	1	1											5	
11/11/2008											1						1	
ARCHERY TOTAL AGE/SEX	**0**	**1**	**6**	**4**	**2**	**5**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**20**	**ARCHERY TOTAL**
11/15/2008		1	1		1	1	1	2									7	
11/22/2008	1	2	3	1	2	1	2										12	
GUN 11/27/2008	1						1	1									3	
11/29/2008		1		1				1	1								4	
12/6/2008	1		1	1		1	2	3									9	
12/13/2008	2				3		4							1			10	
12/20/2008	2	1						1		1					1		6	
SHOTGUN TOTAL AGE/SEX	**7**	**5**	**5**	**3**	**6**	**3**	**10**	**8**	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**51**	**SHOTGUN TOTAL**
SEASON TOTAL AGE/SEX	**7**	**6**	**11**	**7**	**8**	**8**	**11**	**8**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**71**	**SEASON TOTAL**
TOTAL MALE (BUCK) CAX	**40**		**PERCENT OF HARVEST**															
TOTAL FEMALE (DOE) CAX	**31**																	

Yorktown Naval Weapons Station Harvest Data 2008/2009 Season

DATE	0-M	0-F	1-M	1-F	2-M	2-F	3-M	3-F	4-M	4-F	5-M	5-F	6-M	6-F	7-F	8-F	DAILEY TOTAL	
10/4/2008	1	1		2	1	1											6	
10/11/2008		1			3					1							5	
ARCHERY 10/13/2008																	0	
10/18/2008	1		2														3	
10/25/2008	1		1		1	1											4	
11/1/2008	2		1	1	1												5	
11/8/2008					2												2	
11/11/2008		1			1	1	2										5	
ARCHERY TOTAL AGE/SEX	**5**	**3**	**4**	**3**	**9**	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**			**30**	**ARCHERY TOTAL**
11/15/2008	6	7	7	2	8		1	5		1							37	
11/22/2008	10	5	17	4	8	7	2	3	1	1	1			1	1		60	
GUN 11/27/2008	4	1	3	1	2	2	1										14	
11/28/2008						1											1	
11/29/2008	5	4	4	3	3	6	3	3	1						1		32	
12/3/2008						1											1	
12/6/2008	9	5	3	4	4	5	5	2	2	1	1						41	
12/13/2008	5	5	7	4	1	7	1	7	1	2							40	
12/20/2008	10	5	3	4	2	4	3	5	1					1	2		40	
1/3/2009	1	3	0	3				1		1							9	
SHOTGUN TOTAL AGE/SEX	**50**	**35**	**44**	**25**	**28**	**33**	**16**	**26**	**6**	**6**	**2**	**0**	**0**	**2**	**4**	**0**	**277**	**SHOTGUN TOTAL**
SEASON TOTAL AGE/SEX	**55**	**38**	**48**	**28**	**37**	**36**	**18**	**26**	**6**	**7**	**2**	**0**	**0**	**2**	**4**	**0**	**307**	**SEASON TOTAL**
TOTAL MALE (BUCK) NWS	**166**		**PERCENT OF HARVEST**															
TOTAL FEMALE (DOE) NWS	**141**																	
TOTAL MALE CAX/NWS	**206**		**PERCENT OF HARVEST**															
TOTAL FEMALE CAX/NWS	**172**																	
TOTAL HARVEST CAX/NWS	**378**																	



Legend

- Installation Areas
- Quail Call Survey
- Rabbit Survey
- Roads

Source: U.S. Navy 2009.

0 0.5 1 Miles

0 0.5 1 Kilometers

N

F-1. Quail Call/Cottontail Survey Route at WPNSTA.

Prepared For:	**U.S. Navy**
Prepared By:	TETRA TECH
Date:	**04/2010**

P:\GIS\Projects\NAVFAC\MXD\Report\FigureXQuailCallSurvey.mxd

Naval Weaponds Station Yorktown Annual Quail Call/Rabbit Survey Data (1982-2002).

Route #	Year	Date	Observer	Same Obs	Time	Temp	Cloud	Wind	Dew	Stops	Calls	Quail	Young Rabbits	Adult Rabbits	Unknown Rabbits
128-81	1982	7/19/1982	Settle	N		4	1	1	1		54		15	7	3
128-81	1983	7/26/1983	Warden	N		3	3	1	2		10		2	1	23
128-81	1984	7/16/1984	Warden	Y		4	2	3	1		49		1	6	0
128-81	1985	7/9/1985	Shield	N		4	3	1	2		20		1	13	0
128-81	1986	7/1/1986	Shield	Y						1	12		2	7	
128-81	1987	7/9/1987	Wilson	N	5:51	4	1	1	4	8	90		4	11	4
128-81	1988	7/7/1988	Wilson	Y	5:51	3	1	3	1	5	55	11	3	1	7
128-81	1989	7/25/1989	Wilson	Y	6:07	3	1	0	3	6	20	6	15	19	5
128-81	1990	7/26/1990	Wilson	Y	6:07	3	1	1	3	6	38	12	9	8	3
128-81	1991	7/12/1991	Shield/Wilson	Y	5:57	3	1	0	0	5	50	10	10	10	0
128-81	1992	7/14/1992	Shield/Wilson	Y	6:00	4	1	0	3	5	17	8	3	3	1
128-81	1993	7/7/1993	Shield/Wilson	Y	5:53	4	1	2	2	2	11	4	14	3	2
128-81	1994	7/22/1994	Shield/Wilson	Y	6:05	4	3	4	3	0	0	0	3	5	1
128-81	1995	7/6/1995	Shield/Wilson	Y	6:54	3	1	1	3	3	18	5	8	10	2
128-81	1996	6/25/1996	Shield/Wilson	Y	5:45	3	3	1	4	1	2	1	2	1	1
128-81	1997	6/11/1997	Shield	Y	5:47	3	1	1	2	2	13	4	6	7	2
128-81	1998	6/24/1998	Shield/Wilson	Y	5:45	4	3	1	3	0	0	0	0	14	0
128-81	1999	6/23/1999	Shield/Wilson	Y	5:48	2	1	1	4	1	10	2	1	2	0
128-81	2000	6/25/2000	Shield/Wilson	Y	5:49	4	1	2	2	0	0	0	2	2	1
128-81	2001	6/20/2001	Shield/Wilson	Y	5:44	3	1	1	4	2	14	5	1	6	0
128-81	2002	6/27/2002	Shield/Wilson	Y	5:54	4	4	4	1	0	0	0	1	3	0

WPNSTA/CAX Wildlife Food Plots.

Plot Number	Compartment	Number	Acres	Hectares
WPNSTA				
1-1	1	45	0.14	0.06
1-2	1	46	0.61	0.25
1-3	1	47	1.41	0.57
1-4	1	48	0.46	0.19
1-5	1	49	0.41	0.17
2-1	2	28	0.53	0.21
2-2	2	29	0.69	0.28
2-3	2	30	0.52	0.21
2-4	2	31	0.30	0.12
2-5	2	32	3.59	1.45
2-6	2	33	0.27	0.11
2-7	2	34	1.03	0.42
2-8	2	35	1.18	0.48
2-9	2	43	3.06	1.24
2-10	2	44	1.00	0.41
3-1	3	27	0.69	0.28
3-2	3	24	0.38	0.15
3-3	3	25	0.48	0.20
3-4	3	26	0.16	0.07
3-5	3	36	0.63	0.26
3-6	3	37	4.57	1.85
4-1	4	1	0.63	0.25
4-2	4	2	0.55	0.22
4-3	4	22	1.17	0.47
5-1	5	12	0.87	0.35
5-2	5	13	1.06	0.43
5-3	5	14	0.42	0.17
6-1	6	3	0.46	0.19
6-2	6	4	0.43	0.18
6-3	6	5	0.42	0.17
6-4	6	6	0.67	0.27
7-1	7	7	0.19	0.08
9-1	9	20	1.23	0.50
11-1	11	41	2.39	0.97
11-2	11	42	1.07	0.43
12-1	12	40	0.84	0.34
13-1	13	15	0.57	0.23
13-2	13	16	0.72	0.29

WPNSTA (cont'd)

Plot Number	Compartment	Number	Acres	Hectares
13-3	13	21	1.51	0.61
13-4	13	23	1.33	0.54
14-1	14	10	0.56	0.23
14-2	14	11	0.47	0.19
14-3	14	8	0.52	0.21
14-4	14	9	0.42	0.17
15-1	15	17	0.70	0.28
16-1	16	19	0.46	0.19
18-1	18	18	0.91	0.37
18-1	18	38	0.47	0.19
18-2	18	39	1.29	0.52
Total			**44.43**	**17.98**
CAX				
CAX-1			1.37	0.56
CAX-2			0.28	0.11
Total			**1.65**	**0.67**