INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

NAVAL SUPPORT ACTIVITY HAMPTON ROADS
Lafayette River Annex
Northwest Annex
Portsmouth Annex

Prepared for:
U.S. Department of Navy
Naval Support Activity Hampton Roads
8321 Blandy Road, Norfolk, VA

Prepared by:
Gulf South Research Corporation

Final

September 2021

Integrated Natural Resources Management Plan
NAVAL SUPPORT ACTIVITY HAMPTON ROADS

This Integrated Natural Resources Management Plan (INRMP) fulfills the requirements for the INRMP in accordance with the Sikes Act (16 USC 670a et seq.) as amended and Department of Defense Instruction 4715.03 and Chief of Naval Operations Instruction 5090.1E. This document was prepared and reviewed in coordination with U.S. Department of Interior, Fish and Wildlife Service, National Oceanic and Atmospheric Administration – National Marine Fisheries Service, Virginia Department of Game and Inland Fisheries, and North Carolina Wildlife Resources Commission in accordance with the 2006 Memorandum of Understanding for a Cooperative Integrated Natural Resource Management Program on Military Installations.

Approving Official's Signature:

17 Dec 2021

Matt Frauenzimmer
Captain, U.S. Navy
Commanding Officer
Naval Support Activity Hampton Roads

Date

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Approving Official's Signature:


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Cindy Schulz
Field Supervisor
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9/13/21

Date

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Approving Official's Signature:

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July 19, 2021

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Field Supervisor
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Date

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Approving Official's Signature:

Ryan Brown
Executive Director
Virginia Department of Wildlife Resources

Date 7/1/21

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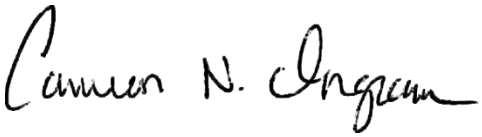
Approving Official's Signature:



Cameron Ingram **Date 4/13/2021**
Executive Director
North Carolina Wildlife Resources Commission

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Naval Support Activity Hampton Roads

INRMP Review

Date of Annual Review/Update	Name and Title of Reviewer(s)
_____	_____
_____	_____
_____	_____
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5th Year Review

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EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) provides Naval Support Activity Hampton Roads (NSAHR) with a viable framework for future management of natural resources on lands it owns or controls to include the assigned properties at NSAHR Headquarters (HQ) Complex, Northwest Annex (NWA), Lafayette River Annex (LRA), and Portsmouth Annex (PA). For clarity purposes, NSAHR refers to all installations, including NSAHR HQ Complex, NSAHR NWA, NSAHR LRA, and NSAHR PA. The primary purpose of an INRMP is to ensure that natural resources conservation measures and military operations on the installation are integrated and consistent with stewardship and legal requirements. An INRMP is required by the Sikes Act (16 U.S. Code [U.S.C] § 670 et seq., as amended), and is a long-term planning document for the Department of Defense (DoD) to guide the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity.

The Sikes Act requires the military services to prepare INRMPs in cooperation with the appropriate federal and state fish and wildlife agencies. The NSAHR INRMP is an ecosystem-based plan developed in cooperation with the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS), the Virginia Department of Wildlife Resources (VDWR), and the North Carolina Wildlife Resource Commission (NCWRC). This INRMP has been prepared in accordance with the Sikes Act and reflects the mutual agreement of these agencies concerning the conservation, protection, and management of fish and wildlife resources.

This INRMP meets the requirements of all applicable DoD and U.S. Department of the Navy (Navy) regulations and policies, facilitates compliance with environmental laws, and integrates the natural resource components of all NSAHR plans and instructions. This INRMP also satisfies the requirements of the DoD Instruction 4715.03, Natural Resources Conservation Program (2011), and its implementing manual, DoDM 4715.03, INRMP Implementation Manual (2013) and follows the “Integrated Natural Resources Management Plan Guidance for Navy Installations” (Navy 2006).

Implementation of this INRMP meets the Commanding Officer’s (CO’s) stewardship responsibilities to implement the Secretary of the Navy Policy for Environmental Protection, Natural Resources, and Cultural Resources Programs (SECNAV Instruction 5090.8B; 30 January 2006), and fulfills the requirements of Chief of Naval Operations Instruction (OPNAVINST) 5090.1E, Environmental Readiness Program, and its implementing manual, OPNAV M-5090.1. This INRMP is used by the Navy for planning and preparing installation related project approvals, management actions, orders, instructions, guidelines, standard operating procedures, and other plans. This INRMP also ensures that military operations and natural resources conservation programs/measures are integrated and consistent with legal and stewardship requirements.

This INRMP also provides technical and planning guidance using decision-making processes that are consistent with the Environmental Management System and compliant with the National Environmental Policy Act (NEPA), and for proper landscape-level management of our natural resources while coordinating with various stakeholders.

Mission drivers at NSAHR generate numerous infrastructure requirements, land use practices, and support services. NSAHR currently has the largest concentration of fleet headquarters administrative and communication facilities outside of Washington, D.C., and supports more than 6,000 personnel that includes major tenant commands: U.S. Fleet Forces Command, Joint Staff Hampton Roads, U.S. Marine Corps Forces Command, Naval Submarine Forces, Atlantic, and Naval Reserve Forces Command.

The INRMP is the primary means by which natural resources compliance and stewardship priorities are set and funding requirements are determined at NSAHR. The Navy intends to implement this INRMP within the framework of the mission, anti-terrorism and force protection limitations, regulatory compliance, and funding constraints. A commitment to implement adaptive management actions and priority projects, as funding permits, comes with the Navy signature endorsements associated with this INRMP.

The INRMP is not meant as a definitive list of projects that will be automatically funded upon enactment of the plan. Any requirement for the obligation of project funding in this INRMP shall be subject to availability of funds appropriated by Congress, and none of the proposed projects shall be interpreted to require obligation or payment of funds in violation of any applicable law, most notably the Anti-Deficiency Act (31 U.S. Code [U.S.C.] 1341 et seq.). As opportunities become available to seek funding for environmental projects, the INRMP provides guidance to natural resource managers on strategies to employ and serves to help prioritize projects to better enable ecosystem management.

This INRMP is guided by the overarching philosophy, directions, and instructions of the DoD and Navy, and reflects the installation's unique mission, land use, and ecological landscape. Consistent with DoDINST 4715.03 and OPNAV M-5090.1, the overriding goal of this INRMP is to support the mission while meeting environmental compliance requirements and protecting and enhancing natural resources for multiple use, sustainable yield and biological integrity. The INRMP presents alternatives and recommendations for the management and stewardship of natural resources without any net loss in the capability of NSAHR to support its mission. Implementation of this INRMP is expected to directly and indirectly provide a conservation benefit to species at risk, including federally listed threatened and endangered species known to, or having the potential to, occur on land controlled by NSAHR. Consequently, in some cases, the implementation of certain recommendations might sacrifice the improvement of natural resources in deference to the safety and efficiency of the mission.

Ecosystems are dynamic, and NSAHR requirements are subject to frequent modification, which requires flexibility in implementing the natural resources management program. To ensure that NSAHR meets the overriding goal, coordination between internal and external stakeholders shall continue over the long term. Annual reviews and updates shall continue by the NRM with formal external review for operation and effect between the CO, USFWS, NOAA-NMFS, VDWR, and NCWRC every 5 years.

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LIST OF ACRONYMS AND ABBREVIATIONS

%	percent
^{o}C	degrees Celsius
^{o}F	degrees Fahrenheit
AARR-F	average annual reduction rate for females
AARR-M	average annual reduction rate for males
ac	acre(s)
AEC	areas of environmental concern
BASH	Bird/Animal Aircraft Strike Hazard
BCC	birds of conservation concern
BGEPA	Bald and Golden Eagle Protection Act
BMPs	best management practices
BO	Biological Opinion
CBM	Coordinated Bird Monitoring
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIN	course identification number
CLE	conservation law enforcement
CLEO	Conservation Law Enforcement Officer
CLEP	Conservation Law Enforcement Program
cm	centimeter(s)
CNIC	Commander, Navy Installations Command
CNO	Chief of Naval Operations
CNRMA	Commander, Navy Region, Mid-Atlantic
CO	Commanding Officer
COMNAVREG MIDLANT INST	Commander, Navy Region Mid-Atlantic Instruction
CRC	Coastal Resources Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Clear Zone Management Plan
DMAP	Deer Management Assistance Program
DoD	United States Department of Defense
DoDINST	Department of Defense Instruction
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order

EPA	Environmental Protection Agency
EPRWeb	Environmental Program Requirements network
ERL	Environmental Readiness Level
ERP	Environmental Restoration Program
ESA	Endangered Species Act
EV	Environmental
EVBL	Environmental Business Line
FDR	fawn per doe harvest ratio
FONSI	finding of no significant impact
ft	foot/feet
ft^2	square feet
FY	fiscal year
GIS	geographic information system
ha	hectare(s)
in	inch(es)
HRPDC	Hampton Roads Planning District Commission
ICRMP	Integrated Cultural Resources Management Plan
IDP	Installation Development Plan
INRMP	Integrated Natural Resources Management Plan
IPM	integrated pest management
km	kilometer(s)
km^2	square kilometers
Legacy	Legacy Resources Management Program
LEED	Leadership in Energy and Environmental Design
LID	low impact development
m	meter(s)
m^2	square meter(s)
MBTA	Migratory Bird Treaty Act
mi	mile(s)
mi^2	square miles
MIDLANT	Mid-Atlantic Region
msl	mean sea level
MOU	Memorandum of Understanding
MWR	Morale, Welfare, and Recreation
NSAHR	Naval Support Activity Hampton Roads
NSAHR HQ	Naval Support Activity Hampton Roads Headquarters Complex

NSAHR LRA	Naval Support Activity Hampton Roads Lafayette River Annex
NSAHR NWA	Naval Support Activity Hampton Roads Northwest Annex
NSAHR PA	Naval Support Activity Hampton Roads Portsmouth Annex
Navy	United States Department of the Navy
NAVFAC	Naval Facilities Engineering Command
NCDENR	North Carolina Department of Environment and Natural Resources
NCWRC	North Carolina Wildlife Resources Commission
NDAA	National Defense Authorization Act
n.d.	no date
NEPA	National Environmental Policy Act
NGOs	non-governmental organizations
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMFWA	National Military Fish Wildlife Association
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NR	Natural Resources
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NRM	Natural Resource Manager
NRP	Natural Resources Program
NSAHR	Naval Support Activity Hampton Roads
NWP	Nationwide Permit
O&MN	Operations and Maintenance, Navy
OHS	oil and hazardous substances
OPNAV	Chief of Naval Operations
OPNAVINST	Chief of Naval Operations Operating Instruction
PAI	Pound(s) of active ingredient per gallon
ppt	parts per thousand
PWD	Public Works Department
QRP	Qualified Recycling Program
RCRA	Resource Conservation and Recovery Act
REPI	Readiness and Environmental Protection Integration
ROTHR	relocatable over-the horizon radar
SAIA	Sikes Act Improvement Act

SALCC	South Atlantic Landscape Conservation Cooperative
SECNAV	Secretary of the Navy
SECNAVINST	Secretary of Navy Instruction
SERDP	Strategic Environmental Research and Development Program
SHPO	State Historic Preservation Officer
SPCCP	Spill Prevention, Control, and Countermeasures Plan
SWAP	State Wildlife Action Plan
SWP3	Stormwater Pollution Prevention Plan
TNC	The Nature Conservancy
U.S.	United States.
UFC	Unified Facilities Criteria
USACE	United States Army Corps of Engineers
USC	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGCRP	U.S. Global Climate Research Program
USGS	United States Geological Survey
VAC	Virginia Administrative Code
VCZMP	Virginia Coastal Zone Management Plan
VDCR-DNH	Virginia Department of Conservation and Recreation-Division of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDOF	Virginia Department of Forestry
VDWR	Virginia Department of Wildlife Resources
VIMS	Virginia Institute of Marine Science
VMRC	Virginia Marine Resource Commission
VPDES	Virginia Pollutant Discharge Elimination System
WMA	Wildlife Management Area

1.0 OVERVIEW

1.1 Purpose

In recognition of the fact that military lands contain significant natural resources, Congress enacted the Sikes Act in 1960 to address wildlife conservation and public access on military installations. The Sikes Act (16 U.S.C. § 670-670f), as amended, requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations in cooperation with the United States Fish and Wildlife Service (USFWS), state fish and wildlife agencies, and when applicable, with National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS). The 1997 amendments to the Sikes Act require the Department of Defense (DoD) to develop and implement an Integrated Natural Resource Management Plan (INRMP) for each military installation with significant natural resources.

The purpose of the INRMP is to ensure that natural resources management is implemented in a manner that provides for sustained support of military operations for current and future generations. The INRMP is designed to integrate natural resources conservation and management efforts with military operations in a manner that is consistent with stewardship mandates and legal requirements [DoD Instruction (DoDINST) 4715.03, 18 March 2011; DoD M-4715.03, 25 November 2013]. It is used by persons planning and preparing installation-related project approvals, management actions, orders, instructions, guidelines, standard operating procedures, and other plans. The INRMP is an extremely important management tool to ensure military operations and natural resources conservation programs/measures are integrated and consistent with legal and stewardship requirements.

The INRMP provides for the management of natural resources, including fish, wildlife, and plants. To the maximum extent practicable, the INRMP incorporates ecosystem management principles and fosters long-term sustainability of ecosystem services (DoDINST 4715.03). Ecosystem services are those benefits obtained from ecosystems to include: "provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth" (DoDINST 4715.03).

The INRMP allows for multipurpose uses of resources, including public access necessary and appropriate for those uses, provided such access does not conflict with military land use requirements. Consistent with the use of military installations to ensure the readiness of the Armed Forces, the purpose of the INRMP is to assist the Installation Commander in their efforts to conserve and rehabilitate natural resources on military lands. To achieve this, management programs and actions in INRMPs must ensure natural resource utilization is: (1) sustainable, (2) in accordance with laws and regulations, and (3) optimally integrated with military installation plans and mission requirements. In this regard, implementation of the INRMP fulfills the Commanding Officer's (CO's) stewardship responsibilities to carry out the Secretary of the Navy Policy for Environmental Protection, Natural Resources, and Cultural Resources Programs (SECNAVINST 5090.8B; 18 October 2018).

An ancillary function of the INRMP is that it may preclude the need for the USFWS to designate critical habitat for federally listed threatened or endangered species. Section 318 of the National Defense Authorization Act (NDAA) of 2004 amended Endangered Species Act (ESA) Section 4 to state that the Secretary of the Interior shall not designate critical habitat on lands owned or controlled by DoD that are subject to an INRMP, if the Secretary determines that the INRMP in question provides a benefit to such species.

1.2 Authority

This INRMP was prepared for Naval Support Activity Hampton Roads to fulfill the requirements of the Sikes Act (16 U.S.C. §§ 670a-670o) and its amendment, the Sikes Act Improvement Act of 1997 (SAIA), as well as the DoD and Department of the Navy (Navy) implementing directives. The Sikes Act requires the Secretary of each military department to prepare and implement INRMPs for each installation that contains significant natural resources.

Per the Sikes Act, each INRMP is to be prepared cooperatively with federal and state wildlife agencies in a manner that adequately covers applicable elements of natural resources management within the installation, including compliance with terms and conditions of relevant biological opinions (BOs). This INRMP was prepared in cooperation with the USFWS, NOAA-NMFS, North Carolina Wildlife Resource Commission (NCWRC) and the Virginia Department of Wildlife Resources (VDWR) and reflects the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources for Naval Support Activity Hampton Roads (NSAHR), which includes NSAHR Headquarters (HQ) Complex, NSAHR Northwest Annex (NWA), NSAHR Lafayette River Annex (LRA), and NSAHR Portsmouth Annex (PA). For clarity purposes, NSAHR refers to all installations, including NSAHR HQ Complex, NSAHR NWA, NSAHR LRA, and NSAHR PA. Federal and state agency correspondence is included in Appendix A, and mutual agreement letters will be inserted into Appendix A upon receipt.

The Sikes Act does not supersede the authority of other environmental laws and regulations. On the contrary, as an overarching planning document the INRMP is designed to facilitate compliance with federal environmental laws and regulations such as the ESA and National Environmental Policy Act (NEPA); state laws and action plans, as applicable; as well as DoD, Navy, Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic Region (MIDLANT) and NSAHR policies. In effect, this INRMP provides a blueprint for how the natural resource management program integrates compliance with the myriad of environmental laws and regulations to continually sustain the mission.

1.3 Scope

An INRMP's scope comprises all lands, ranges, nearshore areas, and leased areas 1) owned by the U.S. and administered by the Navy; 2) used by the Navy via license, permit, or lease for which the Navy has been assigned management responsibility; or 3) withdrawn from the public domain for use by the Navy for which the Navy has been assigned management responsibility (Navy 2006a).

The scope of this INRMP is to outline conservation efforts and establish procedures to ensure compliance with related environmental laws and regulations during INRMP implementation over the five-year duration of the plan. In addition, this INRMP provides NSAHR a feasible framework

for future management of natural resources on owned properties, which includes NSAHR HQ Complex, NSAHR NWA, NSAHR LRA, and NSAHR PA.

Development of this INRMP included input from state and federal stakeholders in addition to cross coordination with other appropriate Navy programs. As required under the SAIA, this INRMP reflects mutual agreement of agencies concerned with the conservation, protection, and management of fish and wildlife resources, including both USFWS Regions 4 and 5, the VDWR, and NCWRC. This INRMP provides the direction for natural resources management at NSAHR; however, it does not replace or affect any federal or state laws, or state responsibility and authority for protecting fish and wildlife resources. Management of agricultural outlease areas established at the Installation are covered by this INRMP.

This INRMP covers a five-year period, but as ecosystems are dynamic and Installation requirements are subject to frequent modification, natural resources management must be flexible. To accommodate these changes, this INRMP will be reviewed and updated annually by Installation personnel and revised and reapproved after five years in coordination with USFWS, VDWR, and NCWRC. Natural Resources (NR) personnel will have responsibility for maintaining the currency of this document.

1.4 Goals and Objectives

The primary goal of this INRMP is to implement an ecosystem based natural resources program that protects, conserves, and promotes sustainable use and management of natural resources on land and within nearshore environments to enable military mission readiness operations and training at all installations under NSAHR. Natural resource management goals and objectives specifically adopted by NSAHR are as follows:

Goal 1. Support the NSAHR military mission by ensuring compliance with applicable natural resources requirements (e.g., laws, executive orders, regulations, and U.S. Navy instructions).

Objective 1.1. Continue to include natural resource management as a component of planning and decision making for execution of military readiness activities and operational requirements.

Objective 1.2. Assure compliance through interagency consultation with federal, state, and local natural resources regulatory agencies. Obtain, maintain, and adhere to natural resources permits required by law.

Objective 1.3. Conduct annual plan review of natural resource program using the Navy Conservation Metrics as well as the Environmental Management System (EMS) with the installation CO, USFWS, NOAA-NMFS, NCWRC and VDWR.

Objective 1.4. Review of the INRMP for operation and effect shall occur no less than every five years with mutual concurrence and acceptance from the installation CO, USFWS, NOAA-NMFS, NCWRC, and VDWR.

Objective 1.5. Provide adequate staffing, equipment, technology, and training for the natural resources program to ensure proper implementation of this INRMP.

Objective 1.6. Ensure INRMP requirements (e.g., adequate staffing, equipment, technology, training, and projects) are entered into the Navy's Environmental Portal and Environmental Program Requirements-Web (EPRWeb) based project proposals or submitted through other funding sources (e.g., DoD Legacy Resource Management Program, forestry reserve, and agriculture outleasing).

Goal 2. Sustain and enhance terrestrial habitats through development of forestry and wildfire management programs, using native plants in landscaping, and conserving resource protection areas.

Objective 2.1. Maintain and enhance the diversity of the forested ecosystem to include the annual production and inventory of commercial forest products, enhancement of forested habitats to benefit wildlife, protection of watersheds, and wildfire management.

Objective 2.2. Design and maintain sustainable landscape areas using native trees, shrubs, herbaceous plants, warm season grasses, and pollinator meadows to reduce maintenance requirements.

Objective 2.3. Identify, preserve, and protect riparian buffer areas, significant ecological communities, and habitat management areas to avoid and minimize impacts resulting from military readiness activities.

Goal 3. Assess, sustain, and enhance the health of natural vegetation communities, wildlife species populations, and suitable habitats; minimize human wildlife conflicts and damage.

Objective 3.1. Identify, monitor, and manage at-risk species (e.g., endangered, threatened, and/or species of concern) in the terrestrial, aquatic, and nearshore environments to avoid and minimize impacts resulting from military readiness activities.

Objective 3.2. Preserve, protect, and manage non-game and game wildlife (e.g., migratory birds, herpetofauna, pollinator species, fish, shellfish, etc.) and their habitats.

Objective 3.3. Protect and manage significant ecological/natural communities, habitat management areas, forestry compartments, and other habitats important for species (flora and fauna) richness or biodiversity.

Objective 3.4. Maintain and enhance native vegetation to promote community diversity, and to eradicate or control and monitor noxious, invasive, and exotic plant species.

Objective 3.5. Implement integrated pest management controls to reduce or eliminate invasive or nuisance species, and species that pose a potential threat to human health.

Objective 3.6. Implement natural resource management strategies and best management practices that provide conservation benefits to the ecosystem and are intended to address risks posed by climate change and sea-level rise.

Goal 4. Manage water resources to sustain and enhance water quality of surface waters, wetlands, the nearshore environment, and other aquatic ecosystems, using a watershed approach.

Objective 4.1. Assess biological conditions, including water quality, of aquatic ecosystems and shorelines, focusing on areas that have the potential to be affected by stormwater runoff, point and non-point source pollution, and/or erosion and sedimentation.

Objective 4.2. Measure and assess water quality of inland and nearshore waters.

Objective 4.3. Apply best management practices for protecting water quality in order to minimize sediment inputs from eroding stream banks and shorelines, and to eliminate potential sources of direct and non-point source pollutant discharges.

Objective 4.4. Enhance the function(s) and value(s) of aquatic freshwater, brackish, and coastal ecosystems through the protection and restoration of wetlands and shorelines, using living shoreline stabilization techniques, where feasible.

Objective 4.5. Promote and implement alternative stormwater management approaches, including low-impact development, to minimize adverse impacts of surface runoff from impervious areas, and to promote water quality within the watershed.

Objective 4.6. Avoid and protect perimeter, streambank, and floodplain wetlands in accordance with state regulations (at a minimum), and enhance these riparian areas consistent with other management objectives (e.g., water quality, habitat requirements) to the extent practicable.

Goal 5. Provide sustainable natural resources-related outdoor recreation opportunities.

Objective 5.1. Monitor and manage populations and herd health of select game species to adjust harvest limits as needed.

Objective 5.2. Provide and promote safe, ethical, and successful hunting and fishing opportunities for all participants to include actions to help recruit and retain hunters and anglers.

Objective 5.3. Manage the hunting and fishing program to allow for access by the public and persons with disabilities, where practicable, provided such access does not conflict with military readiness, security requirements, and does not harm installation natural resources.

Objective 5.4. Promote additional opportunities/sites for outdoor recreation, including establishment of watchable wildlife areas, and nature trails for biking and walking.

Goal 6. Continue to build outreach and stewardship partners to protect and conserve natural resources.

Objective 6.1. Educate installation employees, tenants, housing residents, and contractors about natural resources issues, conservation initiatives, and best management practices.

Objective 6.2. Provide opportunities for installation access among regional stakeholders, local agencies, and academic institutions for environmental education and scientific research and study consistent with resource conservation, in coordination with the natural resources program.

Objective 6.3. Participate in education, outreach, and stewardship initiatives for ecosystem management (e.g., Earth Day, Arbor Day, Clean the Bay Day, Public Lands Day, etc.).

Objective 6.4. Develop partnerships with local community groups, conservation organizations, and private groups to implement wildlife monitoring and protection programs and habitat restoration.

1.5 Guidance and Required Elements

Guidance documents used in the development of this INRMP included: (1) DoDINST 4715.03 Natural Resources Conservation Program; (2) DoDM 4715.03 Integrated Natural Resources Management Plan Implementation Manual; (3) SECNAV Instruction 5090.8B Policy for Environmental Protection, Natural Resources, And Cultural Resources Programs; (4) Integrated Natural Resources Management Plan Guidance for Navy Installations (Navy, 2006); and (5) Chief of Naval Operations Instruction (OPNAVINST) 5090.1E (Navy 2019a), 03 September 2019, and its implementing manual, OPNAV M-5090.1 (Navy 2019b), 03 September 2019. These documents identify and provide detailed guidance on required elements to be included in the preparation and update of INRMPs.

The Sikes Act (§ 670a(b)) states, "Consistent with the use of military installations to ensure the preparedness of the Armed Forces, each [INRMP]… shall, where 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 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 resource management goals and objectives and timeframes 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 subject to the requirements necessary to ensure safety and military security.
- Enforcement of applicable natural resource laws (including regulations).
- No net loss in the capability of military installation lands to support the military mission of the installation.

- Such other activities as the Secretary of the military department determines appropriate.

The following three criteria, consistent with USFWS (2015) and Navy (Navy 2006a) INRMP coordination and development guidance, are used to determine if an INRMP provides adequate benefit (management or protection) to relevant federally listed species such that critical habitat designation is unnecessary:

- The Plan provides a conservation benefit to the species.
- The Plan provides certainty that the management plan will be implemented.
- The Plan provides certainty that the conservation effort will be effective.

This INRMP was developed to comply with the guidance and required elements as described in this section. This INRMP strives to maintain adequate management for listed species currently known, or that have future potential, to occur on NSAHR, removing the need for future designation of critical habitat on the installation.

1.6 Compliance and Stewardship Discussion

Compliance in terms of an INRMP refers to actions that must be taken in order to abide by the statutes and regulations applicable to natural resources. These are actions that an installation is legally mandated or obligated to take in order to meet current or recurring natural and cultural resources conservation management requirements, and for which it must obtain funding. Examples of compliance actions include developing, updating, and revising INRMPs; conducting biological surveys to determine population status of endangered, threatened, and sensitive species; and conducting wetland surveys for planning, monitoring, and/or permit applications. Compliance is essential, so these projects are of the utmost priority.

Stewardship is the responsibility to inventory, manage, conserve, protect, and enhance the natural resources entrusted to one's care in a way that respects the intrinsic value of those resources and the needs of present and future generations (OPNAV M-5090.1). Installations are required to recognize and balance environmental stewardship with mission readiness in retaining control and use of Navy land, sea, and air space for the purpose of maintaining the military mission. Conscious and active concern for the inherent value of natural resources must be given in all Navy plans, actions, and programs (OPNAV M-5090.1). Stewardship projects and programs enhance an installation's natural resources, promote proactive conservation measures, and support investments that demonstrate Navy environmental leadership. Examples include education and public awareness projects, biological surveys or habitat protection for non-listed species, or management and execution of volunteer and partnership programs. Stewardship is an important component of the Navy's Environmental Readiness Program, and because stewardship projects can occur on an indefinite timescale, these projects are prioritized after compliance projects.

The development and implementation of the INRMP is a continual process that does not end with the production of the document. Systematic program feedback and continual improvement, especially within the context of changing environmental conditions, are hallmarks of adaptive management. To the extent feasible, flexibility is built into the INRMP to include processes and programs designed to address change. Adaptive management and INRMP implementation are further facilitated by an Environmental Management System (EMS) following the "Plan-Do-

Check-Act" process, which has the goal of meeting environmental requirements through continual improvement, and achieving both mission support and environmental excellence.

1.7 Review and Revision Process

In accordance with the Integrated Natural Resources Management Program (32 Code of Federal Regulations Appendix to Part 190), the Sikes Act Improvement Act of 1997 and amendments, and Chief of Naval Operations Instruction (OPNAVINST) 5090.1E and the Navy Environmental Readiness Program Manual (Navy Office of the Chief of Naval Operations Manual 5090.1 [OPNAV M-5090.1) (Navy 2019b), installations are required to perform an informal annual review to ensure INRMP information is current, and to evaluate the effectiveness of their INRMP. Formal reviews for operation and effect are performed with the USFWS, state fish and wildlife agencies field-level offices, and when applicable, with NOAA-NMFS (Navy 2006a). Certain developments may necessitate an INRMP revision. These developments include:

1. A change in mission requirements or intensity of land use.
2. A significant change in natural resources baseline condition; for example, a substantial change in the population of a listed species or a new invasive species.
3. The existing INRMP has proven inadequate, was unable to be implemented, or monitoring has shown projects to be ineffective in meeting natural resources management goals.
4. Natural resources management goals have changed or planning horizon of the previous INRMP has expired.
5. Base Realignment and Closure actions.

Annual reviews are performed by NSAHR natural resources staff with cooperation from the USFWS, VDWR, NCWRC, and other stakeholders during Navy Natural Resources Conservations (NRC) metrics meetings. Appendix A will track and document annual reviews and updates starting with the publication date of this INRMP. Annual metrics meetings review INRMP effectiveness and inform the agencies which INRMP projects and activities are required to meet current natural resources compliance needs. This information does not need to be included in the INRMP at the time of review but may be provided after the installation reviews and validates the estimated costs of the requirements (DoD, 2011). There are seven Focus Areas that comprise the Metrics to be evaluated during the annual review of the Natural Resources Program (NRP) and associated INRMP:

1. Ecosystem Integrity.
2. Listed Species and Critical Habitat.
3. Fish and Wildlife Management for Public Use.
4. Partnership Effectiveness.
5. Team Adequacy.
6. INRMP Project Implementation.
7. INRMP Impact on the Installation Mission.

The annual review also provides an opportunity to incorporate changes in accepted environmental conservation practices and scientific advances associated with evaluation and implementation of natural resources management. If necessary, the annual review will include an update to the INRMP that includes an updated project list, documentation of significant changes to natural ecosystems, and updates to information contained in the INRMP appendices. Forms to document annual reviews are included in this document and should be used to document changes to the INRMP that will improve natural resources management. Each entry in the update form should reference the plan section and page number that is being updated to facilitate quick cross-referencing.

Installations are not required to revise their INRMP within a specified time interval; however, a formal review is required every five years in coordination with USFWS, NOAA - NMFS (as applicable), and state partners (per requirements of the Sikes Act, OPNAV M-5090.1, and DoD Manual 4715.03). If USFWS and state partners are in agreement, the completed annual review forms may be used in lieu of a formal review. Minor revisions to the INRMP should be completed annually to reduce the need for a more costly and time-consuming revision following the formal five-year review. Annual reviews should be fully documented each year to provide each installation the option to utilize the annual review documentation to fulfill the formal review requirement whenever possible. If results of the formal review determine that the existing INRMP is effective, the INRMP need not be revised. Any revisions to the authorities and guidance documents driving plan update requirements would be implemented as appropriate during the annual or formal review periods.

Annual and formal reviews of this INRMP will occur every five years in coordination with the USFWS, VDWR, and NCWRC. The formal review shall verify that all environmental compliance projects have been budgeted for and implemented on schedule; that all required natural resources positions are filled with trained staff or are in the process of being filled; projects and activities identified for the coming year are included in the INRMP; all required coordination has been conducted; and that all significant changes to the Installation's mission requirements, or its natural resources have been identified. The Navy class and hierarchy system for INRMP projects, which identifies which projects qualify as environmental compliance projects, are described in Section 6.5.

NEPA requires review of federally supported activities or actions to assess their potential impacts on the environment. The NEPA process is designed to identify potential environmental problems early in the planning process so the proponent of the action can resolve problems in the early stages of project development. OPNAVINST 5090.1E Section-II, Chapter 10, *Environmental Planning Under the National Environmental Policy Act and Executive Order*, sets forth policy, responsibilities, and procedures for integrating environmental considerations into Navy planning and decision-making. INRMP modifications that are necessary are usually covered by the original Environmental Assessment (EA) prepared for the INRMP; however, INRMP modifications should be reviewed to compare the original action documented in the existing INRMP to the proposed modifications, to determine if modifications to the INRMP are significant. If INRMP modifications are deemed not significant, updated actions will be covered by the original NEPA documentation. Proposed INRMP updates that are deemed significant will require additional NEPA documentation, usually at the EA level. An EA and Finding of No Significant Impact (FONSI) have been prepared to document implementation of this INRMP (see Appendix B).

1.8 Roles and Responsibilities

The Sikes Act requires qualified professionals to implement environmental management programs. Implementation of the INRMP at NSAHR is the responsibility of all NR personnel at the Installation, including the NSAHR CO, who is responsible for managing all aspects of the Installation's natural resources; the NSAHR Environmental Director; the NAVFAC MIDLANT Natural Resources Manager (NRM); the Installation NRM; and other Installation personnel. Other Installation personnel, such as security, grounds maintenance, MWR Department, housing, and safety have functions overlapping the NRP, but report to the Environmental Director or NRM on natural resources-related issues.

Chief of Naval Operations (CNO) – The CNO serves as the principal leader and overall Navy program manager for the development, revision, and implementation of this INRMP and associated NEPA documentation by providing policy, guidance, and resources. The CNO approves all INRMP projects prior to submittal to regulatory agencies for signature.

The Commander of Navy Installations Command (CNIC) – The CNIC ensures that installations comply with DoD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They also ensure the programming of resources necessary to maintain and implement INRMPs, participate in the development and revision of INRMPs, and provide overall program management oversight for all natural resources program elements (NAVFAC P-73). CNIC reviews and endorses projects recommended for INRMP implementation prior to submittal for signature and evaluates and validates EPRWeb-based project proposals.

Commander, Navy Region Mid-Atlantic (CNRMIDLANT) – Regional Commanders ensure that installations comply with DoD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They ensure that installations under their control undergo annual reviews and formal five-year evaluations. They ensure the programming of resources necessary to maintain and implement INRMPs, which involves the evaluation and validation of EPRWeb-based project proposals and the funding of installation natural resources management staff. Navy Region MIDLANT maintains close liaison with the INRMP signatory partners (USFWS, NOAA-NMFS, VDWR, NCWRC) and other INRMP stakeholders. The CNRMIDLANT provides endorsement of the INRMP through the Regional Commander signature.

Installation Commanding Officer (CO) – The Installation CO ensures the preparation, completion, and implementation of INRMPs and associated NEPA documentation. The installation CO's role is to: act as a steward of natural resources under their jurisdiction and integrate natural resources requirements into the day- to-day decision-making process; ensure natural resources management and INRMPs comply with all natural resources related federal regulations, directives, instructions, and policies; involve appropriate tenant, operational, training, or associated commands in the INRMP review process to ensure no net loss of military mission; designate a NRM/Coordinator responsible for the management efforts related to the preparation, revision, implementation, and funding for INRMPs, as well as coordination with subordinate commands and installations; involve appropriate legal counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs; and endorse INRMPs via CO signature.

Public Affairs Officer (PAO) – The PAO is involved in aspects of the environmental program at NSAHR. This includes approving the INRMP for public release and being informed of the public notice process required in various NEPA analysis processes.

Community Planner (CPLO) – The CPLO reviews, analyzes, and assesses installation longrange plans for development, encroachment, and provides strategy guidance for meeting future mission needs. The CPLO serves as the primary liaison between the CO and federal and state agencies, municipalities, and neighboring communities. Additionally, the CPLO works collaboratively with various internal and external stakeholders to facilitate partnerships for the Readiness and Environmental Protection Integration (REPI) program.

Public Works Officer (PWO) – The PWO oversees the management of the Public Works Department (PWD), which includes: Facilities Management Division, Facilities Engineering and Acquisition Division, Production Division, and the Environmental Division. The PWO and the Deputy PWO are accountable for life-cycle management of the NAVFAC/CNIC real property (land and facilities) and delivery of facilities projects and services. This includes the comprehensive oversight and planning of all land use issues relating to NSAHR and areas of responsibility. The PWO's role for this INRMP is to ensure that it is aligned with the installation overall facilities "master" plan and that facilities planning initiatives are consistent with and fully supportive of this INRMP. The PWO/DPWO are responsible to initiate environmental planning at the earliest stages of facilities planning and project development to include consideration of INRMP goals, objective, and requirements. The PWD is also responsible to implement portions of the INRMP and to ensure that facilities maintenance and operations are consistently performed in conformance to the INRMP requirements and objectives.

Installation Environmental Program Director (IEPD) – The IEPD is the Head of the NSAHR PWD Environmental Division and provides overall environmental programs management on behalf of the installation's CO. The IEPD, as delegated by command directive, is responsible for the preparation and implementation of this INRMP.

Natural Resource Manager (NRM) – The NRM responsible for natural resources management at NSAHR is based out of NSAHR NWA, and is responsible for natural resources management at NSAHR HQ Complex, NSAHR LRA, NSAHR NWA and NSAHR PA. The NRM reports to the IEPD and is designated in writing by the CO via command directive. The installation NRM has the primary responsibility of managing the natural resources programs on the installation to include, but not limited to overseeing the development, update, and implementation of the INRMP; serving as the primary installation natural resources liaison with the USFWS, VDWR, NCWRC, NOAA-NMFS; and conducting the annual Natural Resources Conservation Metrics.

Environmental Business Line Coordinator (BLC)/Environmental Regional Program Director – Policy guidance, resources, implementation, and technical support is provided by the regional natural resources personnel located with NAVFAC MIDLANT under the direction of the Environmental BLC and Regional NRM. Environmental BLC staff serve as subject matter experts and liaisons for environmental compliance and permitting.

Navy Judge Advocate (JA) – The JA, NAVFAC MIDLANT, provides legal services to the installation on a variety of environmental matters. Particularly pertinent to natural resources management, is their review of NEPA documentation and legal interpretations involving compliance with natural resources laws as they pertain to base operations.

As required by the Environmental Management System, the CO has developed an Environmental Policy for NSAHR (Appendix C). In support of this Environmental Policy, the Installation CO has made certain commitments that include, but are not limited to:

- compliance with federal, state and local environmental laws, regulations and policies,
- integration of environmental stewardship into operational decisions,
- pollution prevention at its source whenever possible, and
- continual improvement of the Installation's environmental performance.

1.8.1 Installation Stakeholders

The organization chart below (Figure 1-1) illustrates the Navy chain of command for NSAHR. OPNAV M-5090.1, Section 1.6 provides a detailed description of environmental responsibilities associated with different positions within the Navy. To implement the INRMP while ensuring successful accomplishment of the military mission, the Commander, Navy Region Mid-Atlantic (CNRMA), acts as a trustee for NSAHR. At the Installation level, the NSAHR CO and the Installation NRM are directly involved in implementation of this INRMP, while ensuring successful implementation of the military mission. The NSAHR CO is responsible for ensuring that NSAHR personnel comply with the laws and requirements relevant to the conservation and management of natural resources. The NRM is responsible for the daily implementation and coordination of the INRMP, as well as ensuring this INRMP is reviewed annually and updated as necessary to reflect current natural resources conditions, and formally reviewed and updated every five years as required by the SAIA. In addition to these responsibilities, the Installation NRM also manages a Microsoft Access database that contains survey, permit/regulatory consultation, and project review information; and is responsible for storing and maintaining equipment needed to conduct management of natural resources at the Installation and to support this INRMP. The Regional NRM provides additional assistance to the Installation NRM for implementation of the INRMP.

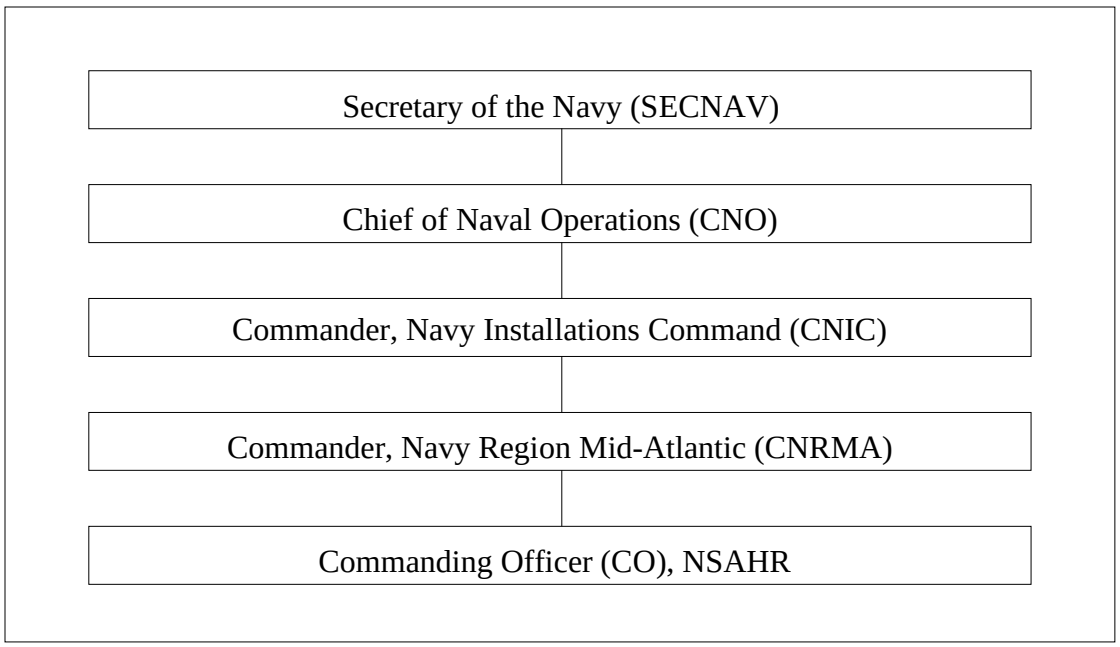

Figure 1-1. Command Organization of NSAHR.

Although these positions hold the primary responsibilities, all personnel at the Installation—including, but not limited to, Public Works Department (PWD), legal staff, the public affairs representative, the local fire department, and the local waterfront security officers—play important roles in supporting the plans and objectives identified in this INRMP, including ensuring environmental compliance within military operations. Other Installation stakeholders, including the Navy's Morale, Welfare, and Recreation (MWR) Department, Regional Environmental Engineers Office, Regional PWD, Navy contractors working at NSAHR and the NSAHR's tenant commands are responsible for sustaining natural resources for economic and recreational purposes, and/or for management and protection.

Stakeholders of NSAHR natural resources include federal and state natural resources agencies, local governments and landowners, civic and conservation groups, and the Navy (see Section 1.8). For this INRMP, a stakeholder is an individual, group, or agency that has the responsibility or mandate to preserve and manage Installation natural resources, that has a right or privilege to make use of the natural resources, or that may be affected directly or indirectly by natural resources management actions conducted at the Installation. Appendix D provides a list of stakeholders currently involved with natural resources management at NSAHR.

1.8.2 External Stakeholders

State and federal agencies, such as USFWS, U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (USACE), U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS), VDWR, and NCWRC are the primary external stakeholders responsible for natural resources protection and preservation. The SAIA requires that this INRMP be prepared in cooperation with, and reflect mutual agreement of, the USFWS, VDWR, and the NCWRC. This requirement affords them signatory authority as external stakeholders and

approving officials of this INRMP. Cooperation and coordination with these agencies is an integral part of the Navy's NRP.

Other external stakeholders include non-governmental organizations (NGOs) and individuals who make use of those natural resources, such as civilian groups, including residents of the surrounding communities who have access to, or are affected by, the condition of NSAHR natural resources, and private conservation organizations.

NSAHR has established several partnerships with government and non-governmental organizations. These are described in Section 3.5 (Partnerships and Outreach).

1.8.3 Technical Assistance

Technical assistance to implement this INRMP may be provided to the CO and NRMs from the Navy or by outside agencies. Assistance from outside agencies is normally provided through individual agency requests and formal cooperative agreements, whereas assistance from within the Navy is normally less formal. During the five-year management period of this INRMP, additional cooperative agreements may be implemented. Technical assistance from organizations outside the Navy may include USFWS, USDA NRCS, U.S. Forest Service, VDWR, North Carolina Department of Environment and Natural Resources (NCDENR), NCWRC, Elizabeth City State University, and The Nature Conservancy (TNC). Technical assistance from within the Navy may be provided by staff from the Installation Environmental Office; NAVFAC biologists, foresters, and soil conservations; and additional staff, as needed and subject to funding, to be hired by the Installation to complete the continuous work to ensure successful implementation of this INRMP. Options for supplemental labor resources from outside the Navy for implementation of this INRMP include contractors, volunteers from local organizations and groups such as Boy Scouts of America, students from local public and private schools and universities, ecology clubs and conservation groups, retired and/or senior citizens. Options for supplemental labor resources are also available from volunteer civilian and military personnel, and their dependents.

1.8.4 Coordination and Development

This INRMP was developed under guidance comprised of Installation and external stakeholders and subject matter experts who have a vested interest in natural resources management on the installation. The INRMP involves the coordination of land users and land managers, managed by NSAHR, and includes the following primary list or representatives:

- Commanding Officer, NSAHR
- Public Affairs Officer, NSAHR
- Community Planner, NSAHR
- Public Works Officer, NSAHR
- Facilities Engineering and Acquisition Division Officer, NSAHR
- Environmental Director, NSAHR
- Security Department, NSAHR
- Explosives Safety, NSAHR

- Fire Department, NSAHR
- Port Operations, NSAHR
- Moral, Welfare, and Recreation Director, NSAHR
- Training Coordinator, NSAHR
- Judge Advocate, NAVFAC MIDLANT
- Environmental Compliance, NAVFAC MIDLANT
- Environmental Planning & Conservation, NAVFAC MIDLANT
- Environmental Restoration, NAVFAC MIDLANT
- Endangered Species and Conservation Planning, USFWS
- Environmental Services, VDWR, NCWRC
- Protected Resources, NOAA-NMFS

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2.0 CURRENT CONDITIONS AND USE

2.1 General Description

NSAHR assigned properties are located within the Hampton Roads region of southeast Virginia (Figure 2-1). NSAHR HQ Complex encompasses approximately 792 acres (ac) (321 hectares [ha]), is located within the Chesapeake Bay watershed, and is adjacent to Naval Station Norfolk, in Norfolk, Virginia. Land use at NSAHR HQ Complex consists of mostly developed land use/cover. Natural resources at NSAHR HQ Complex include wetlands, forest buffers, streams, and vegetation; however, these resources are limited and not frequently impacted by the military mission of NSAHR HQ Complex. NSAHR LRA is also located in Norfolk, Virginia, encompasses approximately 20 ac (8 ha), and is bordered by the Lafayette River to the north and east. NSAHR LRA consists of mostly developed land use/cover and serves an important role in maintaining the health and vigor of the Lafayette River, having nearly 1,200 feet (366 m) of shoreline habitat. Natural resources at NSAHR LRA include oyster gardens, small wetlands, and shoreline buffers and plantings; however, these resources are limited and not impacted by the military mission of NSAHR LRA. NSAHR PA is located in Portsmouth, Virginia, encompasses 110 ac (45 ha), and is bordered by the Elizabeth River to the north and east. NSAHR LRA and NSAHR PA are located within the Chesapeake Bay watershed. While natural resources are minimal and land use/cover is primarily developed at NSAHR PA, the Installation does support environmental goals and objectives. Natural resources at NSAHR PA include oyster gardens, wetlands, shoreline buffers and plantings, and a pollinator garden.

NSAHR NWA lies along the southeastern border of Virginia, and the northeastern border of North Carolina. The current total acreage, as provided by the Navy Real Estate Office, is 3,726 ac (1,508 ha), three-quarters of which is located in Chesapeake, Virginia, and one-quarter located within Currituck County, North Carolina (Figure 2-2). The total acreage, based on Navy GIS data for NSAHR NWA and used throughout this document for natural resources summary purposes, is 3,661 ac (1,482 ha). NSAHR NWA is located in a rural area and has strived to conserve habitats that support special status species and other areas with natural resources value located throughout the Installation.

2.2 Regional Land Use

Adjacent to the world's largest Naval facility, Naval Station Norfolk, NSAHR HQ Complex is well positioned regionally. NSAHR HQ Complex and NSAHR LRA are located within the city of Norfolk, Virginia which is positioned at the center of the Hampton Roads metropolitan area. Norfolk is historically a strategic military and transportation point and is the current headquarters of the Norfolk Southern Railway, a Class I freight railroad, and the Norfolk International Terminal. NSAHR PA is located within the City of Portsmouth, which has a long history of being a port town and city. Agricultural lands border both cities to the south.

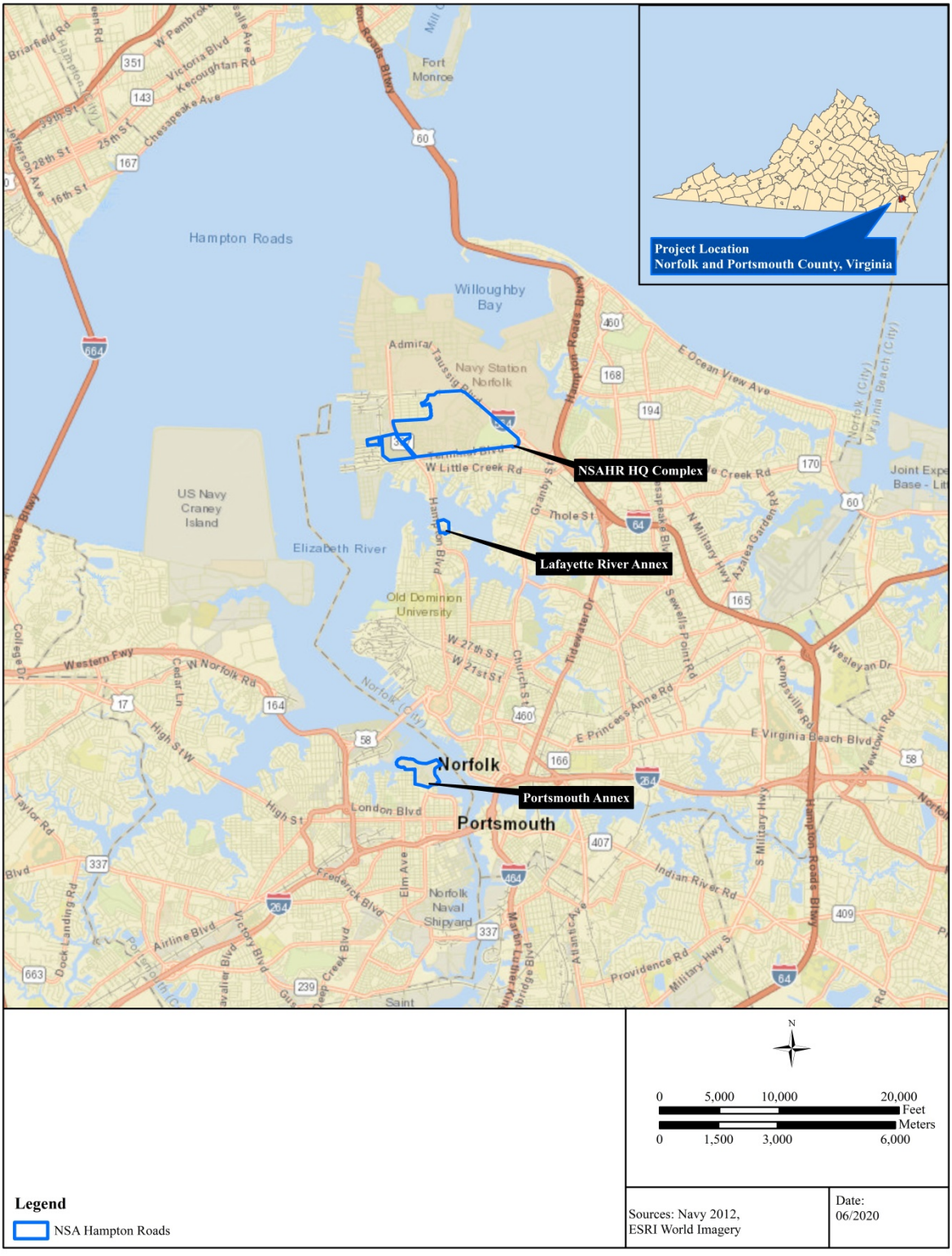

Figure 2-1. General Locations of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA.

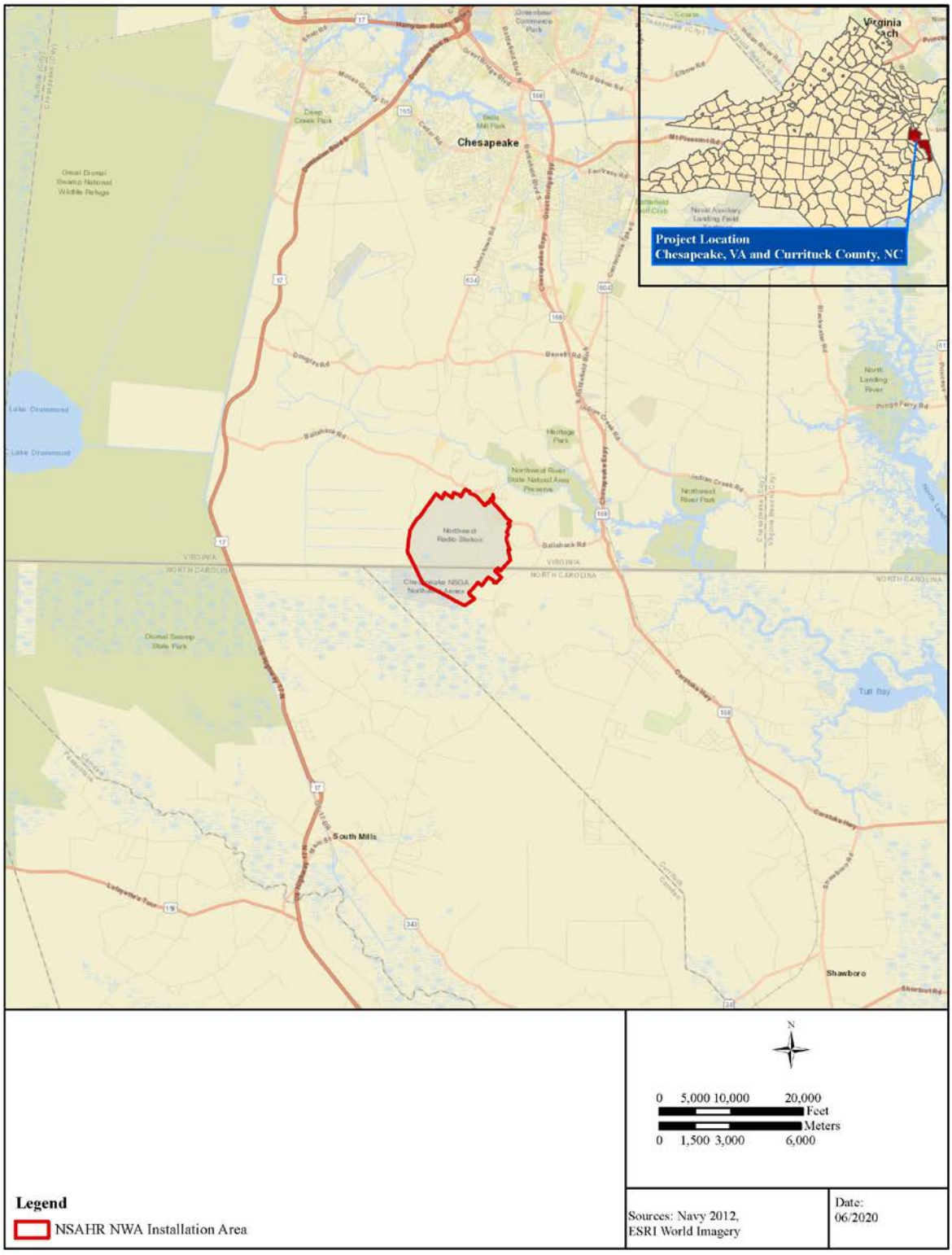

Figure 2-2. General Location of NSAHR NWA.

The area immediately surrounding NSAHR NWA is largely undeveloped and is comprised of agricultural land and forested wetlands. In the last several years, residential development has expanded along the Ballahack Road corridor to the northeast of NSAHR NWA. NSAHR NWA is located within the historic boundaries of the Great Dismal Swamp, which once extended from the James River to the Albemarle Sound. Beginning in the mid-1700s, much of the Great Dismal Swamp, including a large percentage of the land currently occupied by NSAHR NWA, was ditched and drained for agriculture and timber production (Navy 2002a). The largest remaining areas of swamp are restricted to the Great Dismal Swamp National Wildlife Refuge, located to the west of NSAHR NWA, the Northwest River Preserve to the northeast, and various Virginia and North Carolina state reserves in the area.

NSAHR lies entirely within the Chesapeake Bay Watershed. The Chesapeake Bay is the largest estuary in the U.S., and approximately 18 million people and 3,600 species of flora and fauna are found within its watershed. The watershed also contains forests, agricultural lands, wildlife habitat, cities, suburbs, wastewater treatment plants, and heavy industry. Economically, the Chesapeake Bay is significant due to its seafood production, particularly blue crab, clams, and oysters.

2.3 Historic and Pre-Military Land Use

NSAHR HQ Complex

NSAHR HQ Complex was originally part of a World War I-era Army base; the Navy acquired the area that now encompasses NSA HQ Complex in 1941 and 1942 as part of the World War II build-up. Although physically detached, the area became part of Naval Operating Base (NOB) Norfolk (now Naval Station Norfolk). In 2000, the area split from Naval Station Norfolk and was designated NSA Norfolk, which was in turn renamed NSAHR. NSAHR HQ Complex currently encompasses six principal areas, each with its own unique history and pattern of development. These include: South Depot Annex, Joint Forces Staff College, U.S. Fleet Forces Command Compound, Camp Elmore previously Camp Allen, and Sewell's Point Golf Course. The sixth area, the Ben Moreell Family Housing area, has been privatized. NSAHR HQ Complex contains Naval Communications facilities, houses over 35 admirals and generals along with their respective support staffs, and supports one of the largest concentrations of Navy supported housing of any military base. NSAHR HQ Complex encompasses approximately 792 ac (321 ha) and includes NSA HQ, Camp Elmore, the Joint Forces Staff College, NATO, Sewells Point Golf Course, and South Depot Annex.

NSAHR LRA

NSAHR LRA has an institutional history which reaches back into the late eighteenth century. In 1787, the Commonwealth established the first hospital in the country dedicated to treating sailors who required treatment while in Virginia. For 60 years, the U.S. Marine Hospital provided care to a wide range of patients, including fishermen, merchant mariners, Coast Guard personnel, and foreign sailors. NSAHR LRA was acquired by the federal government in 1800 after the establishment of the Marine Hospital Service and became the first U.S. Marine Hospital. The original facility remained in use through the Civil War, after which it relocated to the City of Norfolk. In 1912, the Marine Hospital Service was renamed the U.S. Public Health Service, and the new agency began consolidating the existing network of U.S. Marine Hospitals. The hospital

was closed in 1982 as the result of "under-utilization," and the property was transferred to the U.S. Navy.

The 20 ac annex currently serves as the headquarters of Naval Facilities Engineering Command Atlantic, which is responsible for oversight of all NAVFAC products and services throughout the continental United States, the Caribbean, Europe, and Southwest Asia.

NSAHR PA

NSAHR PA was transferred from the Navy Bureau of Medicine (BUMED) to Commander Navy Installations Command (CNIC) in 2011. The Portsmouth Annex is a comprehensive health care facility for the U.S. Navy located in Portsmouth, Virginia. The campus covers approximately 110 (44.5 ha) ac of property along the south bank of the Elizabeth River. NSAHR PA is a Navy medical center that encompasses nearly 20 (8 ha) ac situated on a peninsula surrounded by the Elizabeth River.

The Hampton Roads peninsula of land, known as Hospital Point, was one of the earliest land acquisitions by English settlers in the Hampton Roads area (Navy 2019c). The first English settler on the site that now comprises Hospital Point, and the adjacent Park View district of the city of Portsmouth, was Captain Thomas Willoughby of Virginia, who acquired the property by patent in 1636. Willoughby does not appear to have made use of the land, and it passed by escheat back to the Virginia Colony. The land was patented twice more before it was sold to Robert Tucker, a Norfolk merchant, in 1718.

The outbreak of the American Revolution marked the beginning of Portsmouth's transformation from an agricultural and commercial harbor to a strategic military port. In the late 1790s, the U. S. Government decided to purchase property for the construction of a new Fort Nelson. Plans for the construction of the Portsmouth Naval Hospital began as early as 1811 when Congress passed a law empowering the Secretaries of War, Navy, and the Treasury to construct a series of hospitals and an asylum, for "sick, disabled, and decrepit seamen". The hospital was completed in 1833.

Although the hospital complex has expanded several times, and the original Hospital itself has undergone substantial renovations, the landscape of Hospital Point has changed little since 1904, when approximately 450 feet of marsh and solid earth were taken from the end of Hospital Point to widen the Elizabeth River channel.

NSAHR NWA

The land on which NSAHR NWA lies was originally acquired by the U.S. government by civil condemnation and purchase beginning in 1951 for use by the Navy as a radio receiving station. By 1955, approximately 4,500 ac (1,821 ha) had been acquired. Construction of the original buildings and structures for Naval Radio Station Northwest occurred between 1952 and 1953. During the early 1960s, a high frequency direction finder Wullenweber antenna array was constructed. This antenna array consisted of two rings of high frequency antennae: an inner ring of approximately 755 ft (230 m) and an outer ring of approximately 853 ft (260 m) in diameter, with a horizontal ground screen approximately 131 ft (400 m) in diameter surrounding the site. The high frequency direction finder station was activated in 1964 and operated until 2001. Although the above-ground

portions of the array have been dismantled, the ground screen and gravel have been left in place to avoid disturbing the soil and other resources.

In 1966, the five separate operating departments at the radio station were consolidated under one department. The Security Group Department consisted of 20 officers and 130 enlisted personnel. In 1970, the Naval Radio Station Northwest was re-designated Naval Receiving Facility Northwest and then, in July of 1975, it was re-designated Naval Security Group Activity Northwest. Also, in the mid-1970s, two parcels of land on the southwest side of NSAHR NWA were transferred back to the City of Chesapeake and State of North Carolina by quitclaim agreement, reducing the property to its current acreage (Navy 1983). In 1985, construction began on the ROTHR in the central portion of the NSAHR NWA. The ROTHR consists of a 1.6-mile (mi) (2.6-kilometer [km]) row of paired aluminum poles and ground screen. The Navy Fleet Surveillance Support Command was established in 1987 to operate the ROTHR in support of Fleet units worldwide. Since 1993, it has been used in counter narcotics surveillance (Navy 2004).

2.4 Military Mission

The current mission of NSAHR installations is to:

- Enable robust command and control for our Navy, Marine Corps, Coast Guard, NATO, and interagency units;
- provide premier training and operational facilities and ranges to sustain our force generation activities;
- support warfighters with world-class medical, family support, and recreational facilities and services; and
- enhance relationships with our community partners in Norfolk, Portsmouth, Chesapeake, and North Carolina.

NSAHR HQ Complex, NSAHR LRA, and NSAHR PA support a diverse group of tenant commands that include representation from many military services and the U.S. Coast Guard. NSAHR HQ Complex tenant commands include:

- U.S. Fleet Forces Command,
- U.S. Marine Corps Forces Command,
- Joint Staff Hampton Roads,
- Joint Forces Staff College,
- Naval Submarine Forces Atlantic,
- Defense Logistics Agency,
- Naval Reserve Forces Command,
- Fire Fighters/Damage Control School,
- Navy Exchange Command, and

- Marine Corps Exchange Command.

NSAHR LRA tenant commands include:

- NAVFAC Atlantic

NSAHR PA tenant commands include:

- Bureau of Medicine

NSAHR NWA supports a diverse group of tenant commands that include representation from all military services and the U.S. Coast Guard (USCG) (Navy 2004). The Installation's 12 current tenant commands are:

- U.S. Marine Corps Security Force Training Company,
- Center for Security Forces,
- Forces Surveillance Support Center,
- Coast Guard Communications Area Master Station Atlantic,
- USCG Maritime Security Response Team,
- Navy Satellite Communications Facility Northwest,
- Joint Regional Correctional Facility Northwest,
- Special Communications Division Submarines Atlantic,
- Space and Naval Warfare Systems Command Detachment Chesapeake,
- Training Support Center Norfolk Detachment Northwest,
- Supreme Allied Commander Transformation, and
- Naval Satellite Communications Facility.

The Navy understands the role INRMPs play in identifying potential conflicts between an installation's mission and natural resources and identifying actions necessary to maintain the availability of mission-essential properties and acreage. An INRMP balances the management of natural resources unique to the installation with military mission requirements and other land use activities affecting an installation's natural resources (DoD and USFWS 2002). The installation is responsible for ensuring the accomplishment of the military mission in a way that sustains and enhances the natural resources on the installation. The NRM accomplishes this requirement by working in close cooperation with military operators to ensure mutual support and understanding.

2.5 Operations and Activities that may Affect Natural Resources

The Navy has taken a proactive approach towards integrating the military mission with concepts of sustainable land use by recognizing that efficient and effective land use planning supports military readiness and sustainability, while also protecting and enhancing the natural resources for multiple use, sustained yield, and biological integrity. Development and human use are inherently limited on military lands that are kept in their natural condition to support the military mission, often resulting in lands that have extremely high ecological value due to high biodiversity, an abundance of rare species, and presence of specialized habitats. As a result, DoD's land management responsibilities include acting as a steward for hundreds of our nation's rarest species and most characteristic habitats (Benton et al. 2008) without compromising the preparedness of the Armed Forces. At the same time, using the land in a sustainable way that preserves the integrity of the ecosystem is vital to ensuring that military mission activities may continue to be conducted on these lands over the long term.

The Navy recognizes that military training and other operational activities have the potential to impact the environment and require precautions to avoid or minimize degradation or harm to natural resources. Mission-related impacts are potentially greatest in operation and training areas located in the Core and Operations management units. The Forest Conservation Management Unit also includes several small training and operational facilities. Management Units are described in more detail and depicted in Appendix X.

A number of direct and indirect impacts to natural resources have resulted from operational activities and past waste disposal practices on NSAHR properties. NSAHR HQ Complex, NSAHR LRA, and NSAHR PA have few natural resources and contain primarily developed lands, and therefore impacts to natural resources are minimal. Hazardous materials spills may exist at these properties; however, these risks are minimal since hazardous materials are not stored in large quantities. In addition, any pesticide and herbicide use may affect soils and water. Other impacts to natural resources may include further land development, pollution runoff, and invasive species.

Major impacts associated with mission activities are associated with maintaining the clear zone for the ROTHR and training and operation activities located in the Operations Management Unit at NSAHR NWA. Military operations at NSAHR NWA have the potential to alter the environmental setting and condition of the natural resources. For example, the construction of roads or conducting military operations within natural habitats is likely to result in a loss of vegetation and habitat. This in turn can lead to erosion, decreased protection of inland areas from storms, degraded or lost habitat for sensitive species, costly repairs to fix roads, and an increased risk of flooding. Although short-term changes in the environmental setting might continue to provide for realistic training opportunities, the absence of long-term management measures to conserve and restore natural resources properly might impede NSAHR NWA's ability to provide realistic training conditions in the future. In addition, environmental damage can place artificial constraints on training through the loss of training acreage, decreased tactical maneuverability, and increased maintenance costs.

This INRMP will be implemented to facilitate the military mission; however, it is necessary to consider limitations due to the management and protection requirements of natural resources. For example, the presence of wetlands and threatened and endangered species limits or prevents certain military activities because of state and federal laws that protect those sensitive resources. Alternative sites or mitigation measures may be required, but natural resources management is never intended to conflict with the military mission. The NRM is responsible for keeping up to date on relevant laws and ensuring installation compliance. Environmental considerations can affect implementation of the military mission; however, these considerations do not significantly affect NSAHR's ability to effectively conduct its military mission.

2.6 Constraints and Opportunities

Land use at NSAHR is largely dictated by mission requirements. Natural resources management issues and other requirements pose the following constraints on the military mission to these properties:

- development in areas adjacent to the properties (see Section 3.6 Encroachment and Adjacent Land Use);
- limitation on new construction in surface waters, wetlands, and floodplains;
- conservation and encouragement of protected flora and fauna species, and their habitats;
- location of cultural probable sensitive areas; and,
- Bird/Animal Aircraft Strike Hazard (BASH) management.

Other constraints to the military mission of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA that are not directly related to natural resources management, but which must be considered, include a helipad and approach/departure routes at NSAHR PA, environmental compliance requirements (such as notices of violation associated with wetland mitigation requirements), restoration activities, and cultural resources (Figure 2-3).

Operational requirements at NSAHR NWA necessitate the separation of the developed core area and most of the mission and training activities. The core area is the intensely developed portion of the Installation adjacent to Ballahack Road. This area supports the NSAHR NWA's storefront activities and several indoor training facilities. The operational area is generally located in the central and eastern portions of the Installation. Although a large portion of the Core Management Unit and a portion of the Operations Management Unit are developed, there are opportunities for habitat improvement, wetlands and water quality protection, and urban forest management. Natural resources constraints on training or other mission-related activities at NSAHR NWA include surface waters and wetlands, and conservation of habitats that support sensitive wildlife species. Outside of the developed portion of the Operations Management Unit, much of this management unit contains agricultural outleases, which along with developed and existing recreational areas, represent areas of opportunity for implementing changes to the military mission. Agricultural outlease areas are discussed and depicted in Section 4.11 and Appendix K, and NSAHR NWA management units are listed in Appendix D.

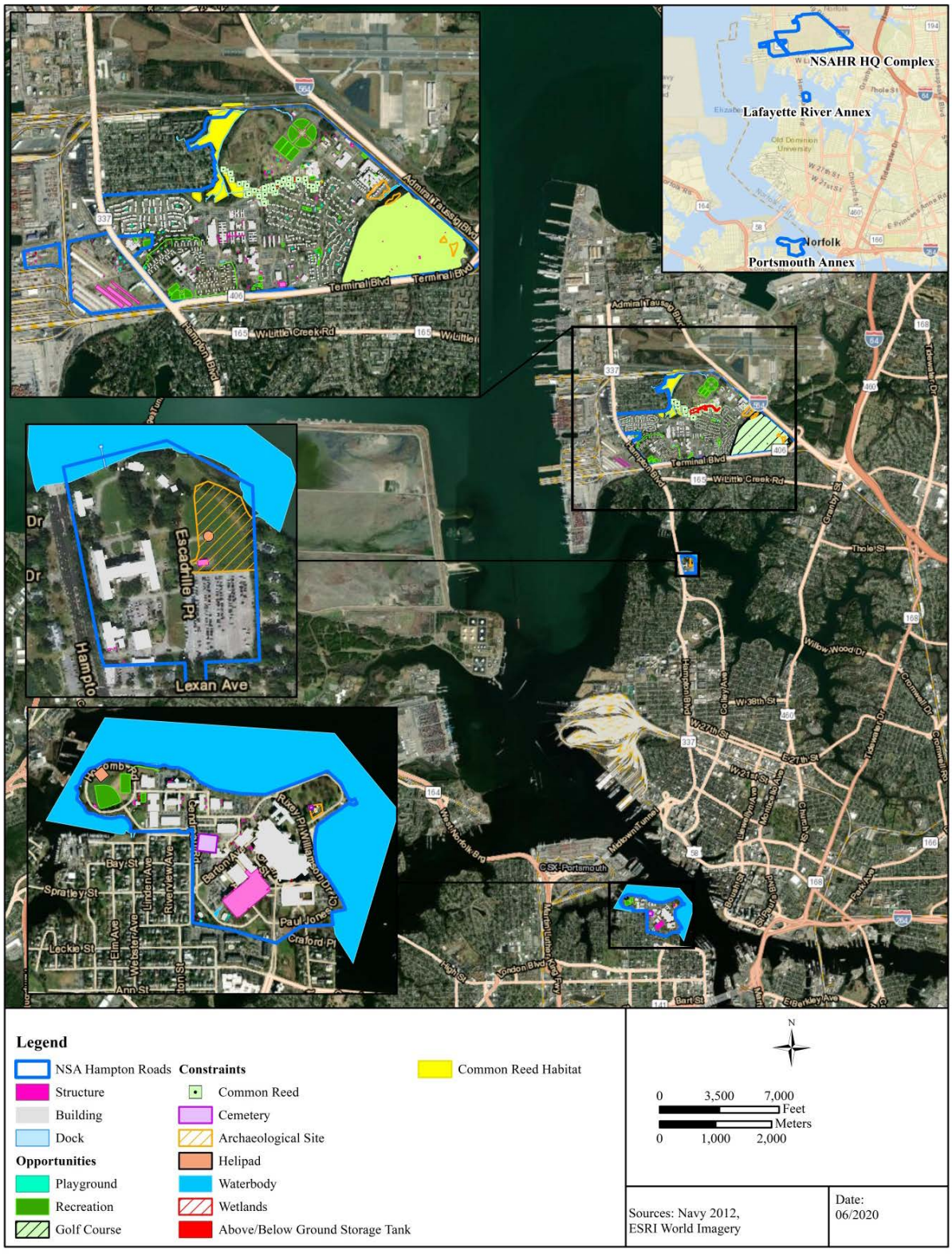

Figure 2-3. Constraints and Opportunities at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA.

Natural resources management issues and other requirements pose the following constraints to NSAHR NWA's military mission and to the further development of its lands:

- limitation on new construction in surface waters, wetlands, and floodplains;
- conservation and encouragement of protected flora and fauna species, and their habitats;
- maintenance of ROTHR clear zones;
- locations of above ground and underground storage tanks, explosive arcs, grave sites, helicopter approach/departure routes, firing fans, and Bird/Animal Aircraft Strike Hazard (BASH) management; and
- locations of potentially sensitive cultural areas.

The major natural resources constraints at NSAHR NWA include streams, wetlands, floodplain areas, and species of concern. Other constraints to the military mission that are not directly related to natural resources management, but which must be considered, include helipad and approach/departure routes, environmental compliance requirements (such as notices of violation associated with wetland mitigation requirements), restoration activities, and cultural resources (Figure 2-4).

Outside of the military mission, natural resources, and other constraints, the remaining areas of NSAHR NWA represent areas where mission activities would not be restricted by mission or natural resources management issues. Opportunity for expansion of training and development are associated with the developed and open areas of NSAHR NWA shown on Figure 2-4. In addition to open areas, there are some possible opportunities for the Navy to leverage undeveloped habitat outside of the NSAHR NWA boundaries in support of the military mission via encroachment partnering (Section 3.7).

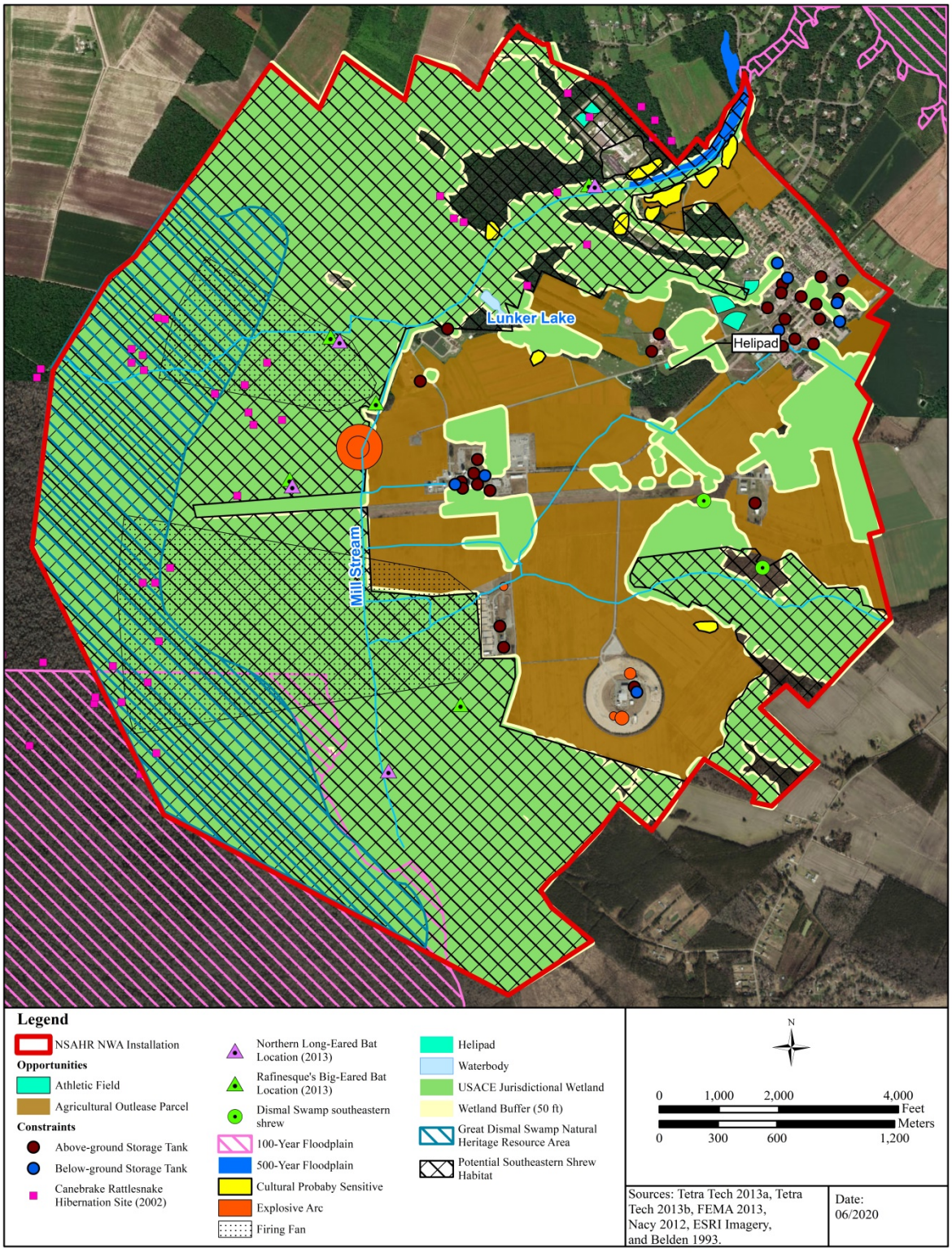

Figure 2-4. Constraints and Opportunities of NSAHR NWA.

2.7 General Physical Environment and Ecosystems

NSAHR is located within the Eastern Temperate Forest Ecological Region of North America, as described by the Commission for Environmental Cooperation. NSAHR HQ Complex NSAHR LRA, and NSAHR PA are located within the Chesapeake Bay Watershed, which is recognized as one of the most important and productive estuarine ecosystems in the world (Figure 2-5). Land cover within NSAHR HQ Complex, NSAHR LRA, and NSAHR PA is primarily developed, and land cover within NSAHR NWA is primarily forested (Table 2-1, Figure 2-6).

Table 2-1. Land Use/Cover Classification of NSAHR NWA.

Land Use/Cover	Acres
Forest	2,345
Agriculture	750
Maintained Open	295
Developed	271
Total	**3,661**

2.7.1 Climate

An understanding of general climate patterns is important to natural resources management because of the effects that weather has on the planning and success of natural resources activities. NSAHR is located in a climactic zone that receives approximately 45.7 inches (in) (116 centimeters [cm]) of precipitation per year, which is generally somewhat concentrated in the late summer. January is the coldest month with an average low of 32.6 degrees Fahrenheit (°F) (0.3 degrees Celsius [°C]), and July is the warmest month with an average high of 87.4°F (30.8°C). The average growing season (daily minimum temperatures higher than 32°F for a light frost) lasts approximately 250 days from 22 March to 21 November. The prevailing wind is from the southwest during the warmer months and northeast during the cooler months. Northeast winds are less common and are usually associated with storm events and the passage of cold fronts. The mean wind speed is 10.5 mi (17 km) per hour. During the hurricane season (June through December), torrential rainfall may accompany these storms with winds greater than 75 mi (121 km) per hour. The average relative humidity is 62 percent (%). The climate summary in Table 2-2 includes data recorded at the NOAA Norfolk International Airport, Norfolk, Virginia weather station from 1946 to 2019 (NOAA 2020).

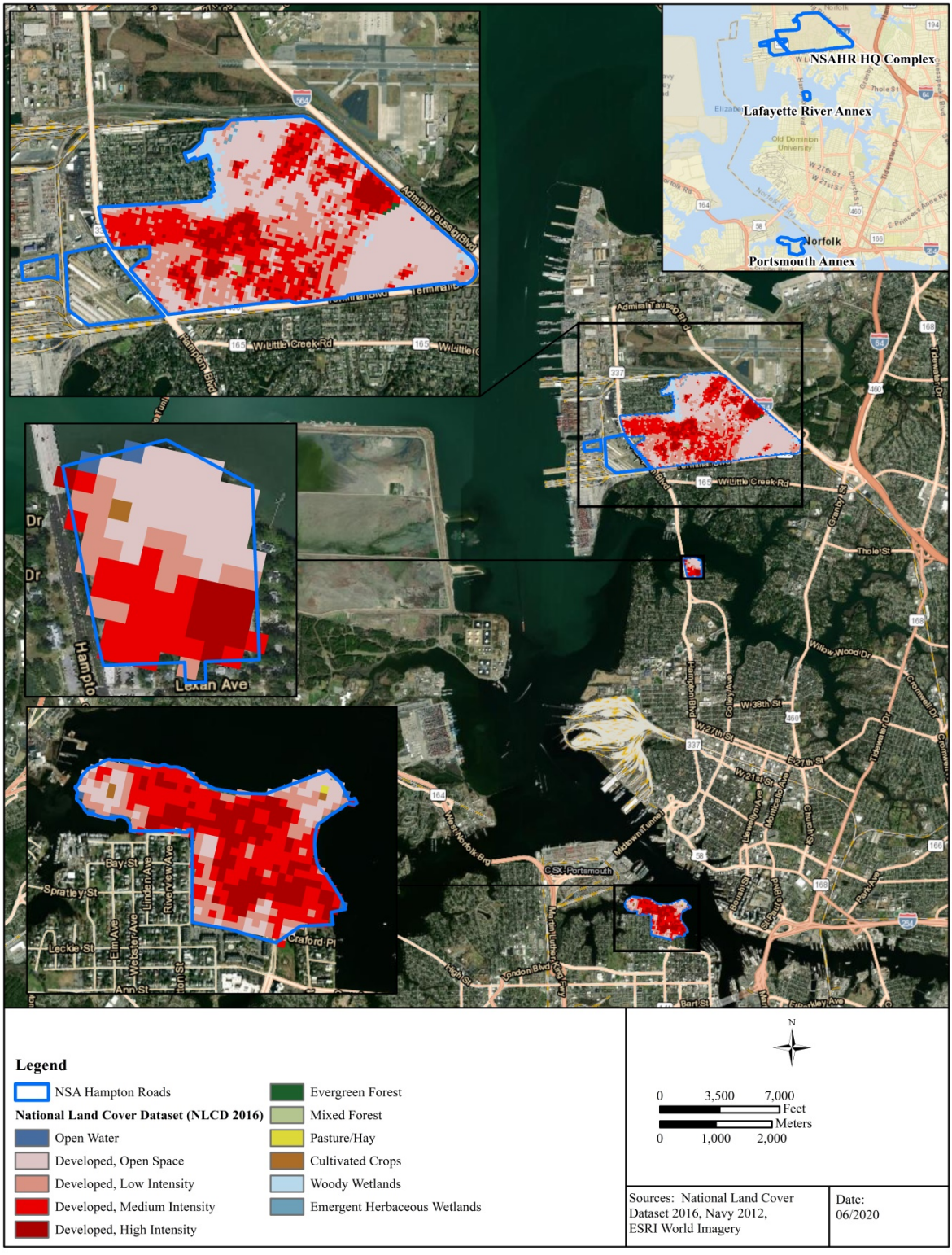

Figure 2-5. Land Use at NSA HQ Complex, NSAHR LRA, and NSAHR PA.

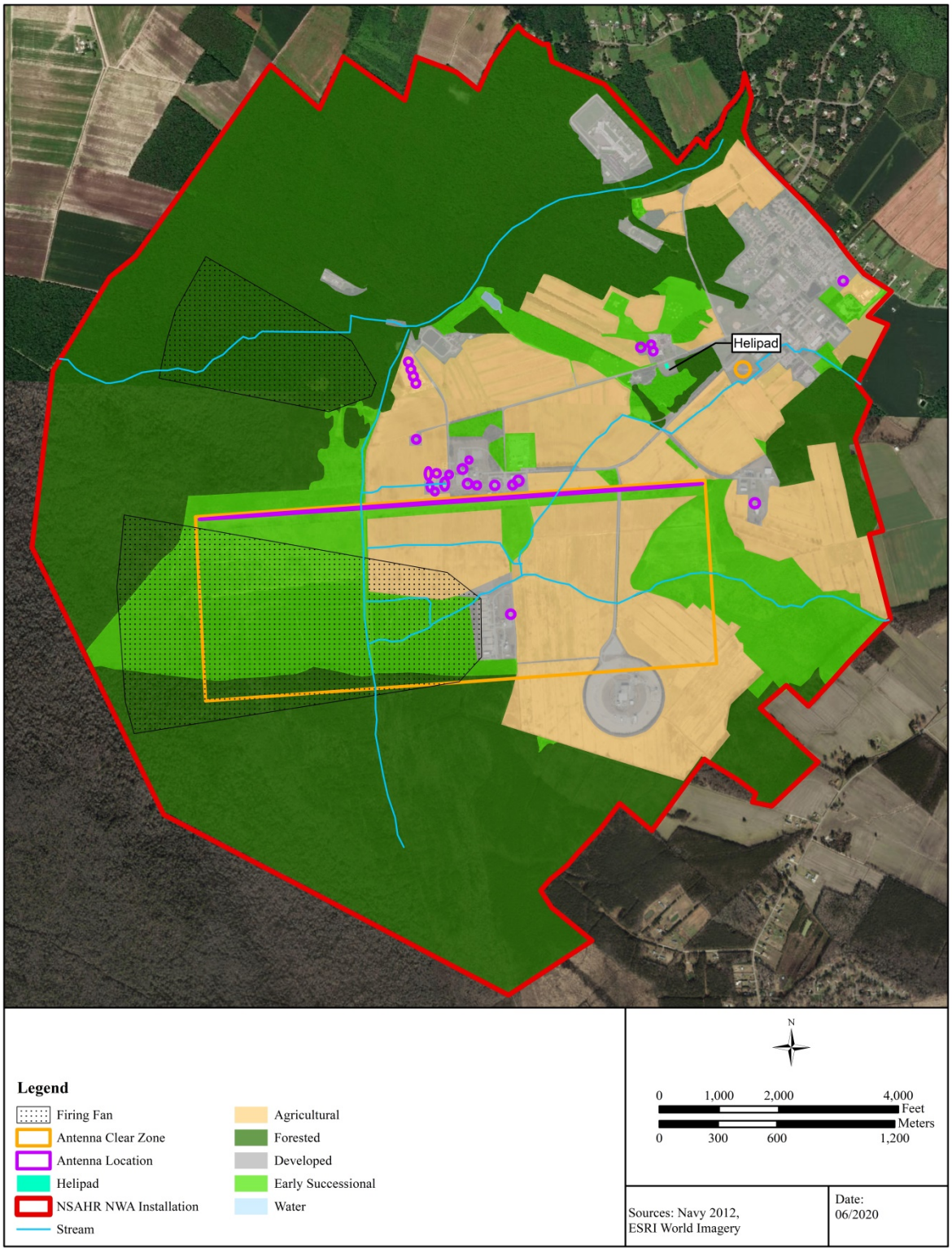

Figure 2-6. Land Use at NSAHR NWA.

Table 2-2. Average Temperature and Rainfall, Norfolk, Virginia, 1946-2019*.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Maximum Temperature (°F)	49.0	51.2	58.2	68.3	76.2	83.8	87.5	85.6	80.2	70.6	61.3	52.8	68.8
Minimum Temperature (°F)	32.6	33.7	40.1	48.8	58.0	66.5	71.2	70.3	65.1	53.9	43.8	36.1	51.8
Average Temperature (°F)	41.0	44.1	49.6	59.6	68.5	76.3	80.0	78.7	73.9	63.8	53.4	46.5	61.9
Precipitation. (inches)	3.49	3.14	3.65	3.12	3.62	3.88	5.37	5.48	4.49	3.24	3.06	3.14	45.68

*Data range for temperatures between 01 January 1946 – 31 December 2019. Source: NOAA 2020

2.7.2 Climate Change

DoD Manual 4715.03 requires the Navy to consider climate change in the development of INRMPs to help mitigate impacts on military installations. In 2009, the U.S. Global Climate Research Program released its *Second National Climate Assessment*, which was written under the authority of the Federal Advisory Committee Act. The report identified several trends and project impacts related to climate change throughout the U.S. as well as within specific regions of the country. Average annual temperature has increased by approximately 1.8°F globally since the beginning of the 20th century, and by 1.2°F over the contiguous U.S. (U.S. Global Climate Research Program [USGCRP] 2018).

To develop adaptation strategies for several coastal DOD installations that are threatened by climate change issues such as rising sea-levels, the SERDP completed a climate change vulnerability and impact assessment, for which NSN was the primary case study. The project, which was entitled, *Risk Quantification for Sustaining Coastal Military Installation Assets and Mission Capabilities*, examined approaches that can quantify potential impacts to critical infrastructure and mission performance in the Hampton Roads area of Virginia. While the study is specifically focused on NSN, the assessment framework will help policymakers and natural resource managers develop strategies that support mission adaptation and long-term sustainability at DOD installations in the region (SERDP 2017).

The state of Virginia has been experiencing hotter summers in recent decades, a trend that is projected to continue in the future. Decreases in air quality, worsening seasonal pollen allergies, increased mosquito and tick-borne infections, coastal flooding, and sea-level rise are also projected to continue (NRDC 2018). The Hampton Roads region of Virginia is especially susceptible to coastal flooding because it is low-lying and experiencing subsidence (EPA 2016, NRDC 2018).

2.7.3 Physiography and Soils

All NSAHR properties are located within the Outer Coastal Plain physiographic province, which greatly influences the topography, soils, and hydrology. The Coastal Plain physiographic province consists of an eastward-thickening wedge of unconsolidated sediments consisting of gravels, sands, clays, and varying amounts of shell material (Roberts and Bailey 2002). This physiographic province is characterized by flat, low relief elevations of 0–60 feet (ft) (0–18 meters [m]) above mean sea level (msl). Within this province, topography generally slopes eastward toward the Atlantic Ocean. NSAHR, however, is within a region influenced by a geologic feature called the Fentress Rise, which extends from Norfolk, Virginia to the Albemarle Sound, North Carolina. This region consists of a gently inclined, west-facing slope that dips toward the Great Dismal Swamp.

Due to the close proximity to the Elizabeth River, the approximate elevation at NSAHR HQ Complex ranges from 0-8 ft (0-1.5 m, Figure 2-7), 0-2 ft (0-0.61 m, Figure 2-7) at NSAHR LRA, and 0-8 ft (0-1.5 m, Figure 2-7) at NSAHR PA. Table 2-3 provides a brief description of the major characteristics of the soils occurring at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA.

Approximate elevation at NSAHR NWA ranges from 14–24 ft (4–7.3 m) above msl (Figure 2-8), and the Installation is depicted on two USGS 7.5 minute series map sheets: the Lake Drummond South East Quadrangle and the Moyock Quadrangle. A majority of the Installation has elevations of about 16 ft (5 m) above msl, with the exception of a small rise located in the center of NSAHR NWA that has an elevation of 24 ft (7.3 m) above msl.

There are six soil types identified by USDA NRCS among NSAHR HQ Complex, NSAHR LRA, and NSAHR PA (Figure 2-9). All soils are urban land complex soils on flat slopes, with the exception of Bohicket muck found at all three properties which is a very frequently flooded soil found in flat slopes (USDA NRCS 2020a). Table 2-3 provides a brief description of these soils.

A review of the most current USDA NRCS soils data has identified 20 soil types at NSAHR NWA (Figure 2-10), not including water and urban land. The association of soils found along the northeastern edge of the Installation includes Bojac, Munden, and Tetotum fine sandy loams. These soils are well drained to moderately well drained and are the driest soils on NSAHR NWA. The Dragston, Tomotley, Roanoke, and Munden fine sandy loams are somewhat poorly drained or moderately well drained. Many of the remaining soil associations on the Installation are poorly drained to very poorly drained and are included on the List of Hydric Soils of the U.S. (USDA NRCS 2020a). Hydric soils include Nimmo fine sandy loams, Tomotley loams, Acredale loams, Portsmouth loam, Hyde silt loam, Weeksville mucky silt loam, Gertie silt loam, and Nawney silt loam. The Portsmouth loam, Hyde silt loam, Belhaven muck, Dare muck, and Nawney silt loam are the wettest soils at NSAHR NWA and were formed from decomposed organic materials or mineral soils rich in organics. The hydric soil associations encompass approximately 90% of the Installation's land area. Table 2-4 provides a brief description of the major characteristics of the soils occurring at NSAHR NWA.

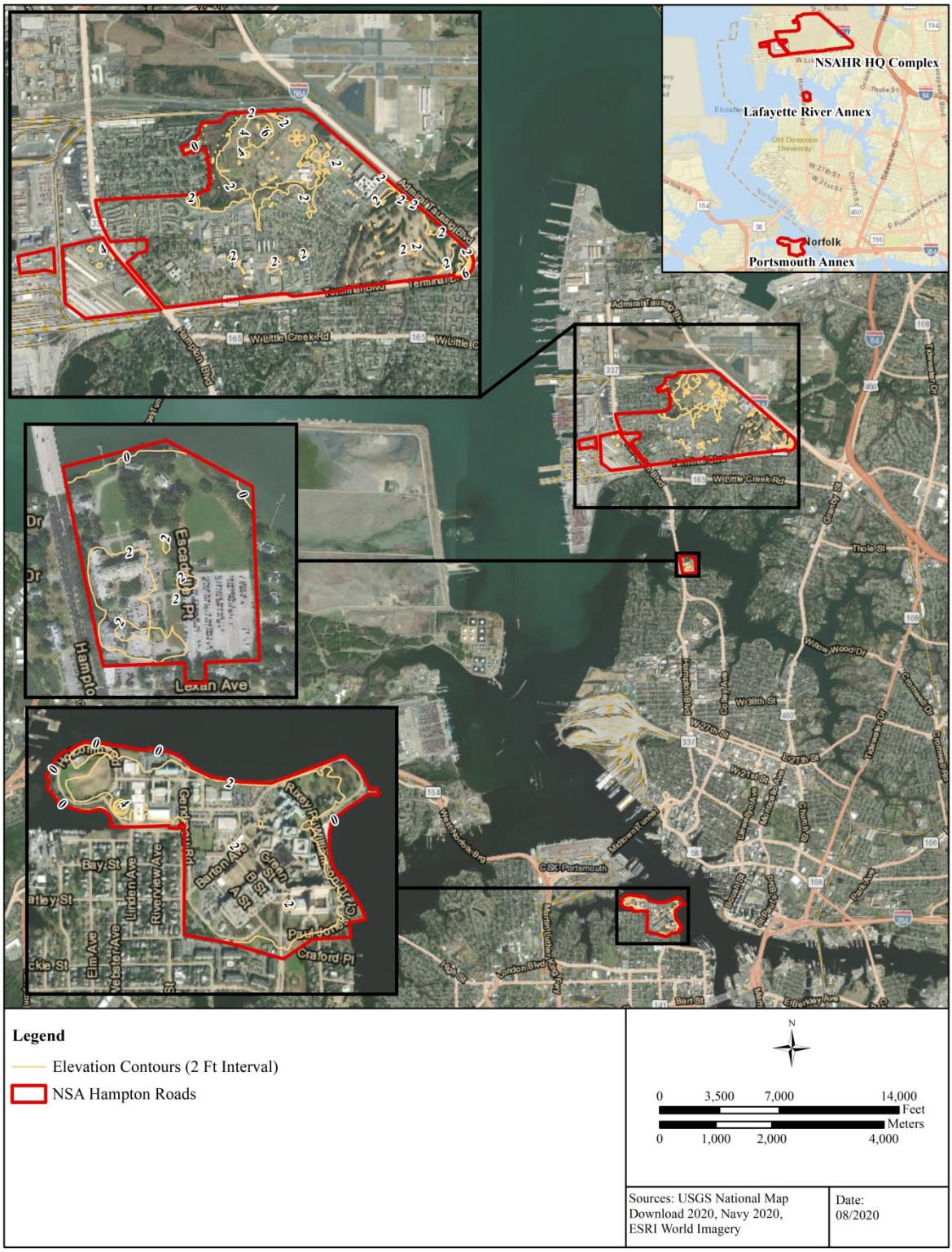

Figure 2-7. Elevation Contours of NSAHR HQ Complex, NSAHR LRA, NSAHR PA, and surrounding areas.

Table 2-3. General Characteristics of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA Soils

Soil Map Unit	Soil Code	Acres	Description
Nonhydric Soils			
Altavista-Urban land complex	1		Deep, nearly level, somewhat poorly drained Altavista soils that include areas covered by parking lots, buildings, and other structures. These soils are approximately 40% Augusta soils, 35% urbanized areas, and 25% other soils.
Augusta-Urban land complex	2		Deep, nearly level, somewhat poorly drained Augusta soils that include areas covered by parking lots, buildings, and other structures. These soils are approximately 40% Augusta soils, 35% urbanized areas, and 25% other soils.
Beaches	4		Long, narrow areas adjacent to the Chesapeake Bay, Atlantic Ocean, or Elizabeth River. These areas consist mostly of sandy material deposited by wave action and that is flooded daily by tides.
State-Urban land complex	22		Soils found on broad ridges and side slopes, and consist of deep, nearly level, well drained soils and areas covered by parking lots, buildings, and other structures. These soils are approximately 40% State soils, 35% urbanized areas, and 25% other soils.
Tomotley-Urban land complex	24		Soils found on broad inland flats, and consist of deep, nearly level, poorly drained souls and areas covered by parking lots, buildings, and other structures. These soils are approximately 40% Tomotley soils, 35% urbanized areas, and 25% other soils.
Udorthents-Dumps complex	26		Udorthents are deep or very deep, well drained or somewhat excessively drained, nearly level to very steep, loamy and clayey soils. These soils are mainly on summits and side slopes in the uplands. They mostly consist of overburden and waste rock that have been stockpiled during quarrying or mining and soil material that has been cut and filled during road or building construction. These soils occur in or near quarries and mines, along highways, and near large buildings.
Urban land	27		On Urban land, more than 80% of the surface is covered by asphalt, buildings, or other impervious materials. On-site investigation is needed to determine land use limitations.
Hydric Soils			
Bohicket muck	6		Soils characterized by nearly level and poorly drained soils found on tidal marshes.
Other			
Water	W		Water.

Source: USDA NRCS 2020a

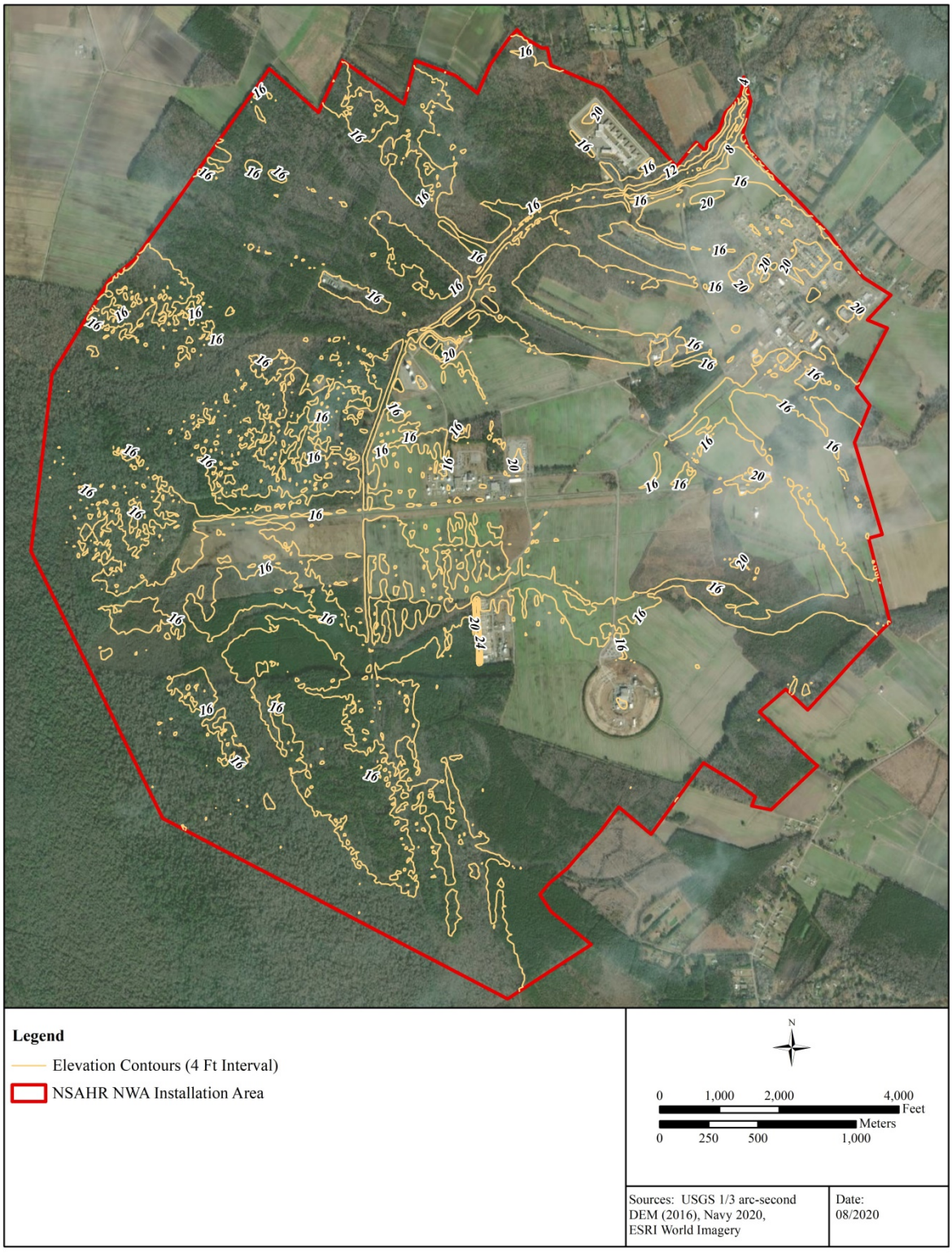

Figure 2-8. Elevation Contours of NSAHR NWA.

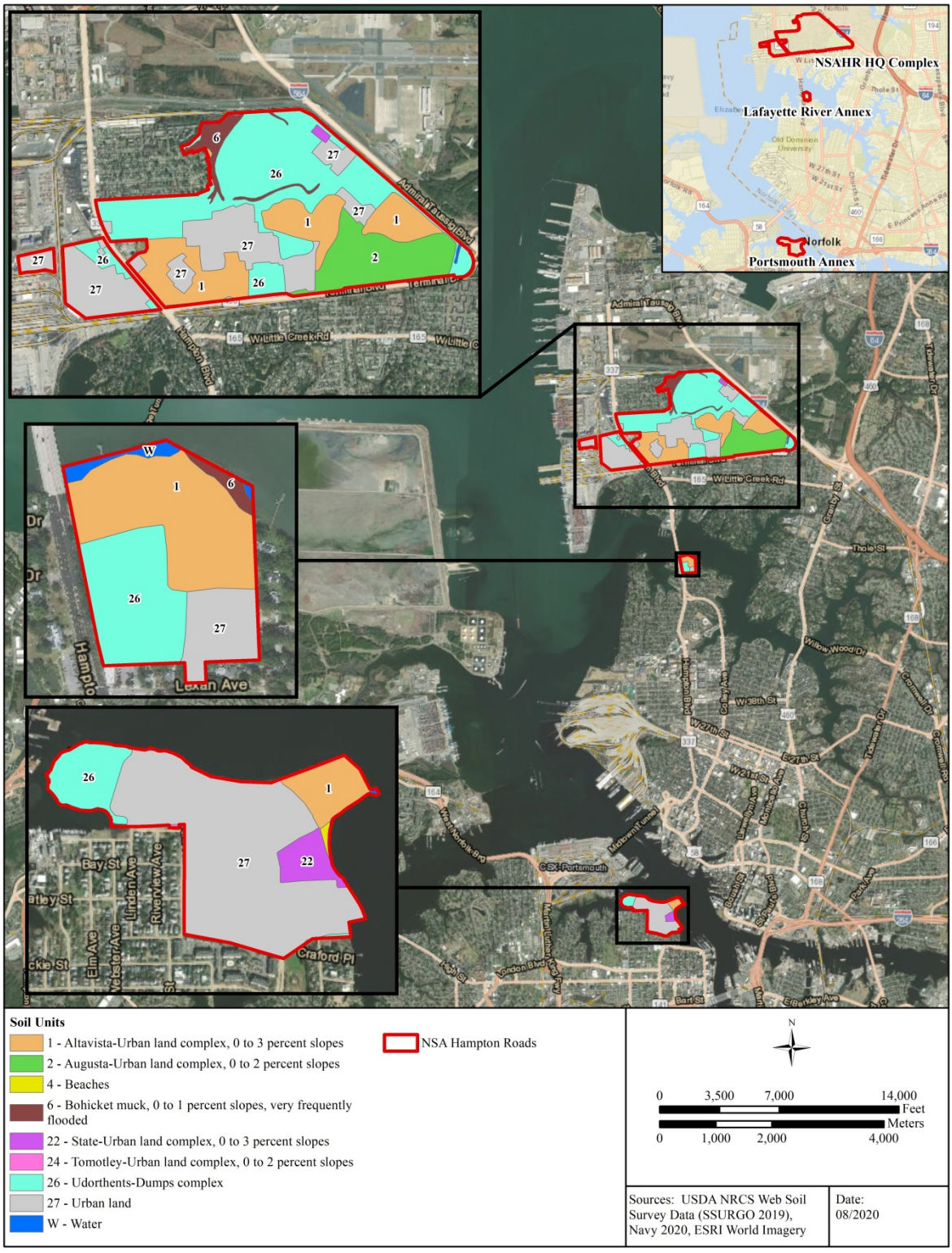

Figure 2-9. Soils of NSAHR HQ Complex, NSAHR LRA, NSAHR PA.

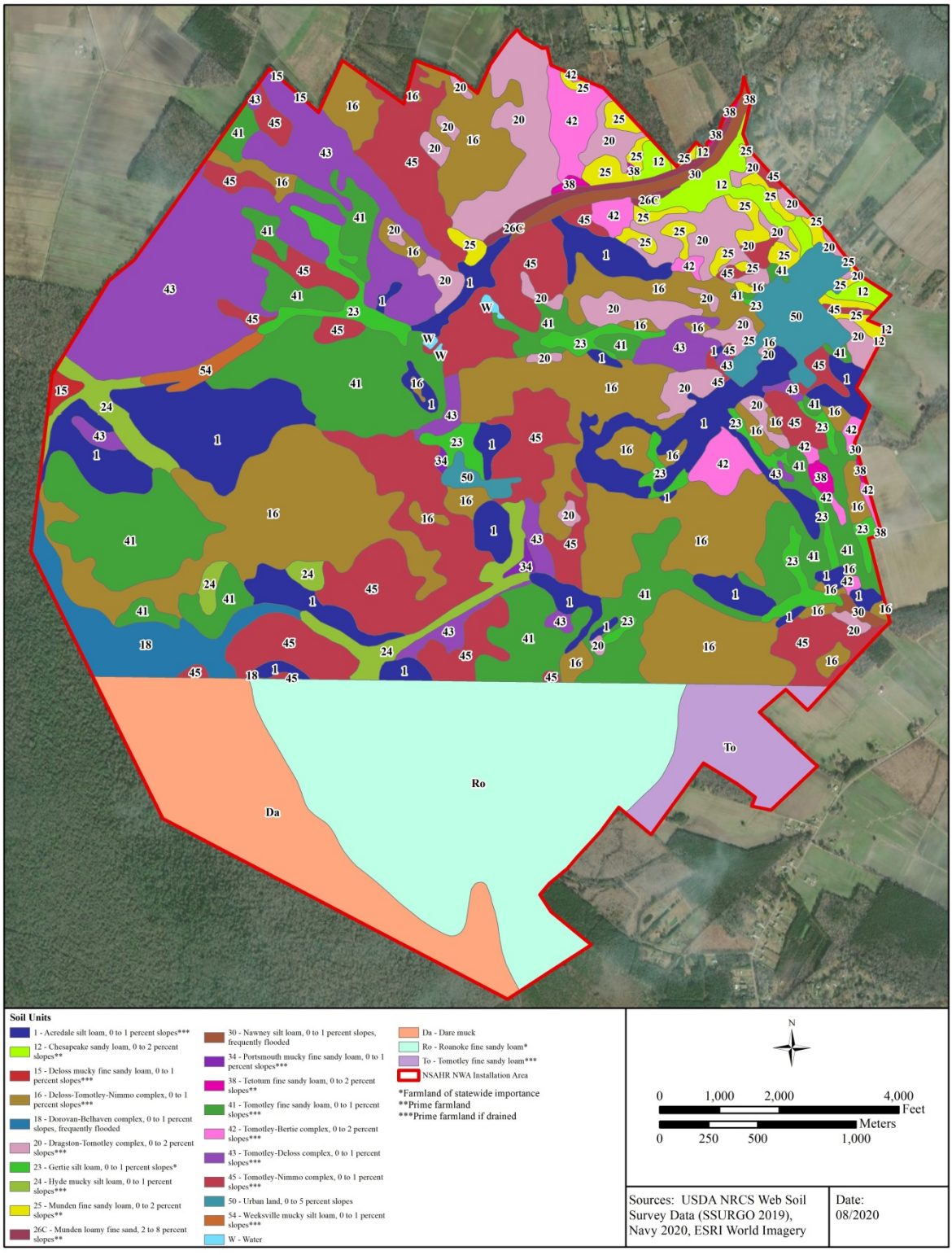

Figure 2-10. Soils of NSAHR NWA.

Table 2-4. General Characteristics of NSAHR NWA Soils

Soil Map Unit	Soil Code	Acres	Description
Nonhydric Soils			
Dragston-Tomotley complex***	20	196.1	The Dragston component makes up 70% of this soil map unit and the Tomotley component makes up 25%. Slopes for both components are 0–2%. This soil type is located on marine terraces on coastal plains. The natural drainage class is poorly drained (Tomotley) to somewhat poorly drained (Dragston). A seasonal high water table and sandy textured substratum are limitations to development.
Munden fine sandy loam**	25	64.6	These soils are moderately well drained and occur on low ridges and side slopes of 0–2%. Surface runoff is slow. These soils are low in organic matter and fertility and are very strongly acid to moderately acid. A seasonal high water table and moderately rapid subsoil permeability are limitations to development.
Munden loamy fine sand	26C	4.0	These soils are moderately well drained (seasonal high water table of 18 to 30 inches) and found on slightly lower landscapes with 0–8% slopes. Munden soils are typically very strongly acid to moderately acid, unless limed.
Urban land	50	63.0	On Urban land, more than 80% of the surface is covered by asphalt, buildings, or other impervious materials. On-site investigation is needed to determine land use limitations.
Chesapeake sandy loam**	12	40.6	These well drained soils are located on marine and stream terraces on coastal plains with slopes of 0–2%. The parent material consists of loamy alluvium and/or loamy marine deposits. A seasonal high water table and sandy textured substratum are limitations to development.
Tetotum fine sandy loam**	38	8.0	These deep, moderately well drained soils occur on inland ridges and side slopes of 0–2%. They are extremely to strongly acid. Development is limited by moderate wetness.
Hydric Soils			
Deloss-Tomotley-Nimmo complex***	16	609.2	The Deloss component makes up 35% of this soil map unit, the Tomotley component makes up 30% and the Nimmo component makes up 25%. The natural drainage class is very poorly drained (Deloss) to poorly drained (Tomotley and Nimmo). This soil type is located on marine terraces on coastal plains. A seasonal high water table is the main limitation for development.
Roanoke fine sandy loam*	Ro	497.6	These poorly drained soils are located on coastal plains and depressions on marine terraces. The parent material consists of clayey marine deposits and/or fluviomarine deposits. A seasonal high water table is the main limitation for development.

Table 2-4. General Characteristics of NSAHR NWA Soils, Cont.

Soil Map Unit	Soil Code	Acres	Description
Tomotley-Nimmo complex***	45	448.6	The Tomotley component makes up 78% of this soil map unit, and the Nimmo component makes up 20%. These poorly drained soils occur on broad inland flats with slopes of 0–1%. Surface runoff is slow. The soil is low in organic matter and fertility, and ranges from extremely acid through strongly acid. A seasonal high water table and sandy textured substratum are limitations to development.
Tomotley fine sandy loam***	41 and To	520.1	These soils are poorly drained and occur on broad inland flats and poorly defined drainageways with slopes of 0–1%. Surface runoff is slow. The soil is moderate in organic matter and low in fertility, and ranges from extremely acid through strongly acid. A seasonal high water table is the main limitation for development.
Acredale silt loam***	1	320.5	These poorly drained soils occur on broad inland flats with slopes of 0–1%. Surface runoff is very slow. The soil is moderate in organic matter, is medium in fertility, and ranges from extremely acid through strongly acid. A seasonal high water table, slow permeability, and low strength are the main limitations to development.
Tomotley-Deloss complex***	43	314.1	The Tomotley component makes up 55% of this soil map unit, and the Deloss component makes up 40%. These poorly (Tomotley) to very poorly drained (Deloss) soils are located on loamy marine deposits of 0–1%. The parent material consists of loamy marine deposits. A seasonal high water table is the main limitation for development.
Dare muck	Da	235.9	These very poorly drained soils are on pocosins and coastal plains with slopes of 0–2%. The parent material consists of herbaceous organic material over sandy fluviomarine deposits. A seasonal high water table is the main limitation for development.
Gertie silt loam*	23	80.9	These poorly drained soils are on marine terraces on coastal plains of 0–2%. The parent material consists of clayey marine deposits. A seasonal high water table is the main limitation for development.
Hyde mucky silt loam***	24	67.1	These soils are deep, are very poorly drained, and occur on inland flats and slight depressions. Severe wetness and slow percolation limit development. A seasonal high water table is the main limitation for development.

Table 2-4. General Characteristics of NSAHR NWA Soils, Cont.

Soil Map Unit	Soil Code	Acres	Description
Dorovan-Bethaven complex	18	65.9	The Dorovan component makes up 55% of this soil map unit, and the Belhaven component makes up 40%. These very poorly drained soils are located on floodplains and coastal plains. The parent material consists of herbaceous organic material and/or woody organic material. A seasonal high water table is the main limitation for development.
Tomotley-Bertie complex***	42	63.6	The Tomotley component makes up 60% of this soil map unit, and the Bertie component makes up 35%. The parent material consists of loamy marine deposits. These poorly drained soils are located on marine terraces on coastal plains of 0–2%. A seasonal high water table is the main limitation for development.
Nawney silt loam	30	2.1	Nawney soils are deep, are very poorly drained, and occur on inland drainageways. Flooding and severe wetness limit development. A seasonal high water table is the main limitation for development.
Weeksville mucky silt loam***	54	12.3	These very poorly drained soils are located on marine terraces on coastal plains of 0–1%. The parent material consists of silty marine deposits. A seasonal high water table is the main limitation for development.
Deloss mucky fine sandy loam***	15	5.9	These very poorly drained soils are located on marine terraces on coastal plains with slopes of 0–1%. The parent material consists of loamy marine deposits. A seasonal high water table is the main limitation for development.
Portsmouth mucky fine sandy loam***	34	4.2	These soils are very poorly drained and occur on broad inland flats and depressions. Surface runoff is very slow. The soil is high in organic matter and low in fertility, and ranges from extremely acid through strongly acid. A seasonal high water table and sandy substratum are limitations to development.
Other			
Water	W	3.2	Water.

* - Farmland of Statewide Importance

** - Prime Farmland

*** - Prime Farmland, if drained

Sources: USDA NRCS 2020a, 2020b, and 2012a, and 2012c and SSURGO 2019

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, and fiber crops and is available for these uses. It can include cultivated land, pastureland, forestland, or other land that is not urban or built-up land or water areas. Soils at NSAHR NWA that are classified as prime farmland are Chesapeake sandy loam, Munden loam fine sand, Munden fine sandy loam, and Tetotum fine sandy loam, and, when adequately drained, Acredale silt loam, Deloss mucky fine sandy loam, Deloss-Tomotley-Nimmo complex, Dragston-Tomotley complex, Hyde mucky silt loam, Portsmouth mucky fine sandy loam, Tomotley fine sandy loam, Tomotley-Bertie complex, Tomotley-Deloss complex, Tomotley-Nimmo complex, and Weeksville mucky silt loam (USDA NRCS 2020a and 2012b). With the exception of previously developed areas, these soils are regulated under the Farmland Protection Policy Act (7 USC §4201 et seq.). The Farmland Protection Policy Act restricts actions of the federal government that would cause the irreversible conversion of prime and unique farmland to nonagricultural uses.

A survey by NRCS is needed to determine if NSAHR NWA agricultural fields are prime, or unique farmland soils before permanent conversion of any agricultural fields can be authorized at NSAHR NWA. Until this action is completed, those agricultural lands that fall into prime and/or unique farmland soil categories will be treated as prime and unique agricultural lands.

2.7.4 Hydrology

Floodplains

The Federal Emergency Management Agency defines the 100-year floodplain as an area that has a 1% chance (1 year out of every 100 years) of being equaled or exceeded in any given year and is the standard used by federal agencies for floodplain management. The 500-year floodplain is an area that has a 0.2% chance (1 year out of every 500 years) of a flood in a year. The USACE also regulates discharges of dredged or fill materials within 100-year floodplains. Floodplain management is discussed in further detail in Section 4.18.

Some portions of NSAHR HQ Complex are located within the area determined to be outside the 500-year flood and protected by levee from 100- year flood. Other portions of NSAHR HQ Complex are located within the 1% annual chance flood event area. All of NSAHR LRA is located within the 1% annual chance flood event area. Some portions of NSAHR PA are located within the area determined to be outside the 500-year flood and protected by levee from 100- year flood. Other portions of NSAHR PA are located within the 1% annual chance flood event area.

In the Virginia portion of NSAHR NWA, a section of Mill Stream and a narrow adjacent area are within the 100-year and 500-year floodplains (Figure 2-12). The remaining Virginia portion of the Installation is mapped as being outside the 100-year floodplain. The southwestern portion of NSAHR NWA area located within North Carolina is located within a 100-year floodplain and is associated with the large wetland area that covers the western half of the Installation. However, the 100-year floodplain area designated in North Carolina is not mapped as a floodplain area north of the North Carolina border (Figure 2-12).

Surface Water

Surface water resources at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA are limited due to predominantly developed lands (Figure 2-11). NSAHR HQ Complex contains some drainage ditches and excavated ponds, as well as a restored stream designed to reduce pollution runoff (see Section 4.10.2 Erosion and Sediment Control). NSAHR PA is located adjacent to the Elizabeth River and contains drainage ditches that flow into the Elizabeth River, as well as a drainage area that receives runoff water and flows into the Elizabeth River (see Section 4.2.4 Stormwater Quality). NSAHR LRA is located adjacent to the Lafayette River and contains no additional surface water resources. Section 4.17 Coastal/Marine Management discusses protections that apply to the surface waters of the Elizabeth River and the Chesapeake Bay.

Surface water resources at NSAHR NWA include Mill Stream, an unnamed tributary of the Northwest River, an extensive network of drainage ditches and canals, and several small, excavated ponds (Figure 2-12). In areas where drainage is poor, ditch drainage is often inadequate, and flooding may occur. The ponds include the remaining portions of three recreational fishing ponds dug in the 1960s and a sewage treatment pond. The three fishing ponds originally consisted of Bass Pond (south of Lunker Lane) and Catfish ponds 1 and 2 (north of Lunker Lane). Bass Pond has subsequently become dewatered and consists of a scrub shrub wetland community with a small area of open water. Catfish ponds 1 and 2 have been joined and are now called Lunker Lake. The total surface water area of Lunker Lake is approximately 1.4 ac (0.6 ha). The seasonally or semipermanently flooded, forested wetlands can have overland flow, but are not considered a component of the surface water resources at NSAHR NWA.

Stormwater Quality

Stormwater management is an important part of point source and nonpoint source pollution control; these issues are managed outside of the INRMP, under separate plans and programs. Stormwater management is discussed in further detail in Section 4.2.4.

Watershed

NSAHR HQ Complex, NSAHR LRA, and NSAHR PA are located within the Chesapeake Bay watershed, which is recognized as one of the most important and productive estuarine ecosystems in the world. The Navy is a signatory to (or otherwise subject to the requirements of) a number of Chesapeake Bay agreements and rules, which identify goals and commitments aimed at the preservation and restoration of the Chesapeake Bay. These agreements and laws are listed, and protections are discussed further in Section 4.2.3 Watershed Protection.

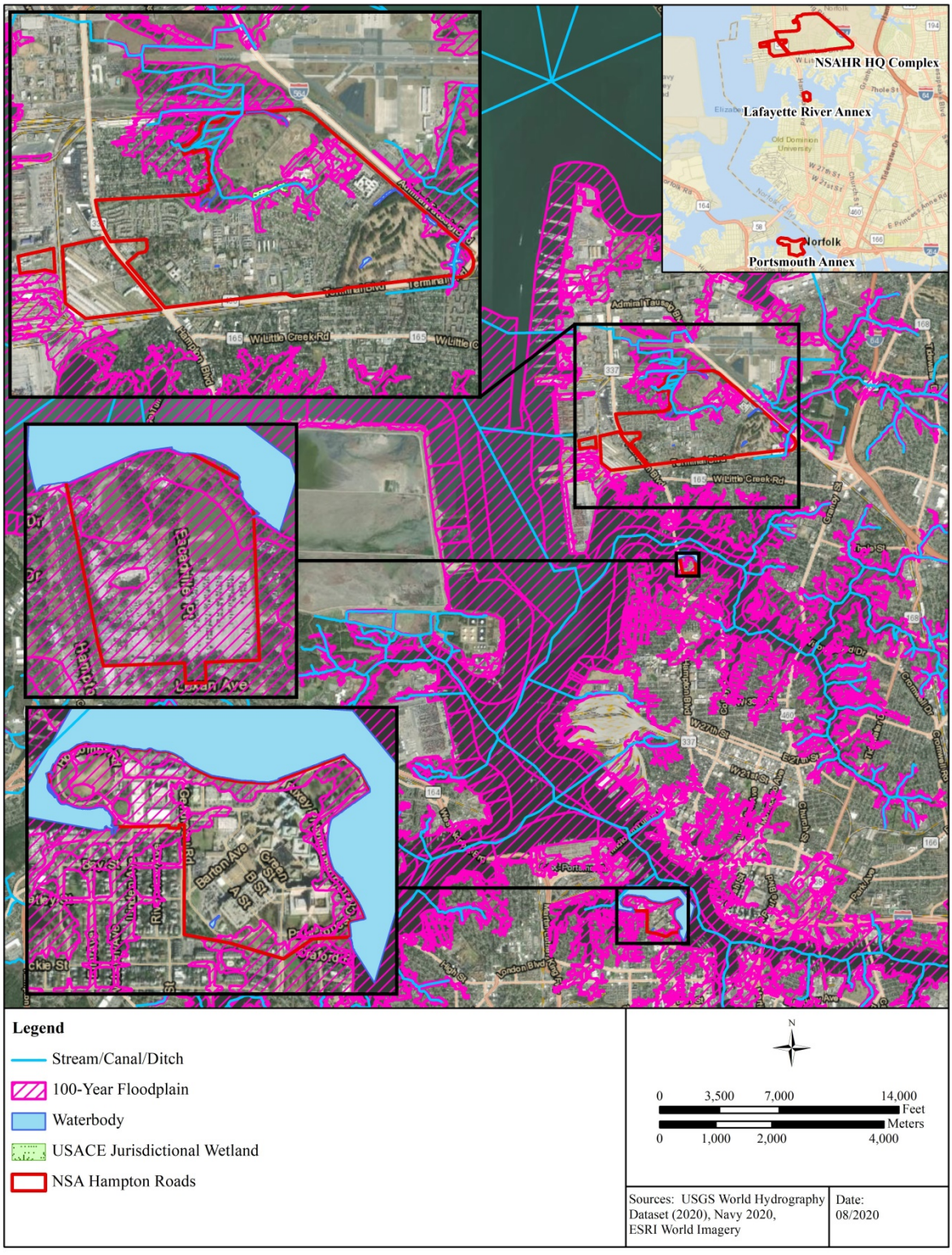

Figure 2-11. Water Resources of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA.

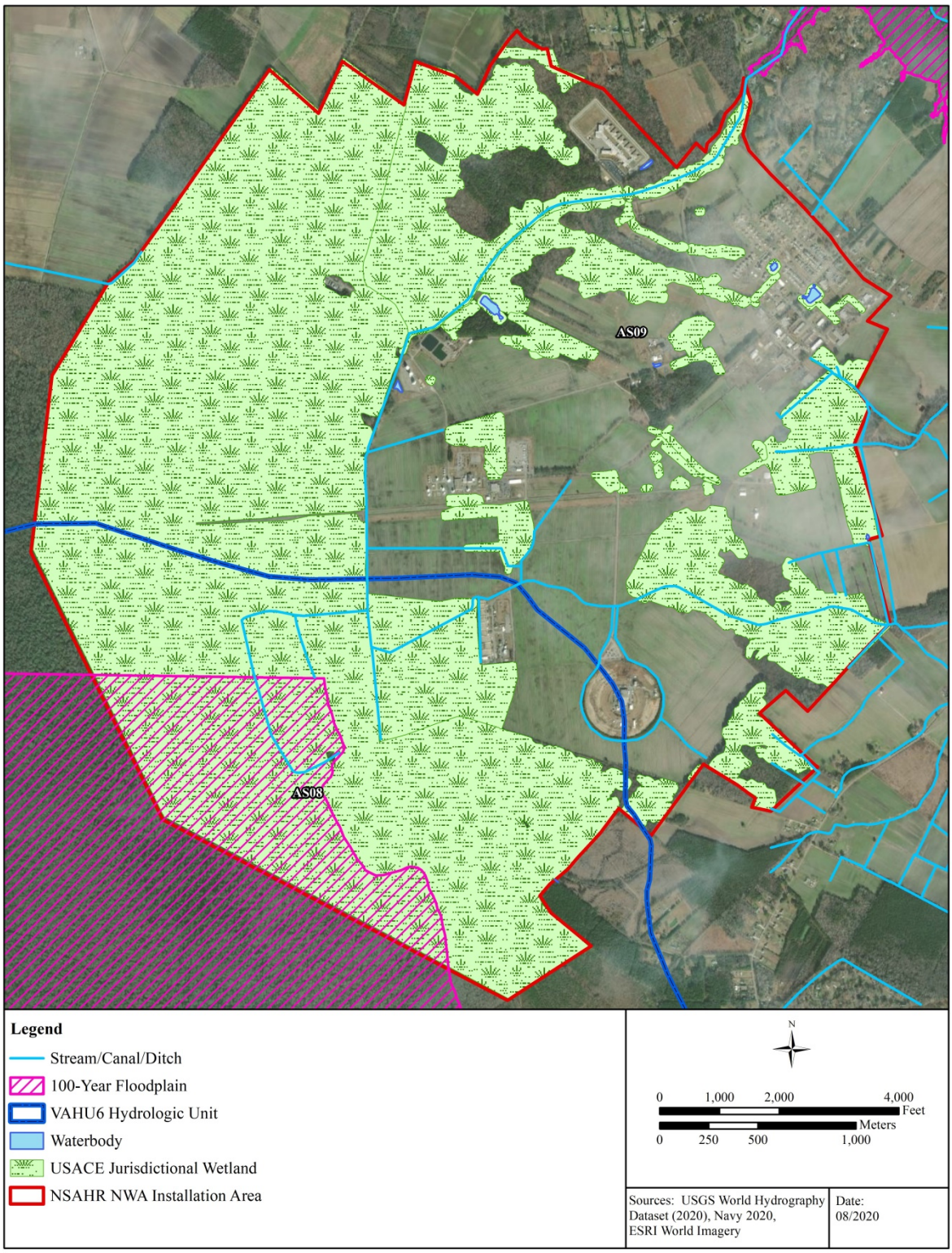

Figure 2-12. Water Resources of NSAHR NWA.

NSAHR HQ Complex lies within the James River Watershed, which consists of the largest river in Virginia. The James River begins at the Appalachian Mountain System and empties at the Chesapeake Bay in Hampton Roads. The watershed is approximately 340 miles (547 km long and encompasses 6,400,000 ac (2,589,988 ha). Approximately 15,000 miles (24,140 km) of tributaries are found within the James River Watershed. The James River Watershed is one of five large river watersheds within the Chesapeake Bay Watershed, which is the largest watershed of the Atlantic Seaboard of North American and spans more than 40,960,000 ac (16,575,900 ha).

NSAHR HQ Complex is located within the Mason Creek subwatershed, which encompasses 3,520 ac (1,425 ha). The Mason Creek subwatershed experiences both tidal and precipitation stormwater events which can affect drainage.

NSAHR LRA, also within the James River Watershed, is located within the Lafayette River subwatershed, which encompasses 8,877 ac (3,592 ha). The Lafayette River subwatershed supports 40% of the residents of Norfolk and is tidally influenced by the Elizabeth River. NSAHR PA falls within the Lower James River subwatershed, which runs from the fall line in Richmond, Virginia and ends at the Chesapeake Bay. NSAHR PA, via the Natural Resources and Encroachment Action Programs, has formed partnerships and obtained easements to conserve land off Installation property to protect these watersheds and the military mission (Navy 2015b).

NSAHR NWA lies entirely within the Southern Rivers Watershed, which represents the lands draining the southern half of Virginia into the Albermarle-Pamlico Sound in North Carolina, or across the southwestern portion of Virginia into the Ohio River and then to the Mississippi River and the Gulf of Mexico (VDCR DNH 2018). The Southern Rivers Watershed covers approximately 325 square miles (mi^2) (842 square kilometers [km^2]) in the cities of Chesapeake and Virginia Beach and contains three subwatersheds: Back Bay, North Landing River, and Northwest River (Hampton Roads Planning District Commission 2005). The Southern Rivers Watersheds Area is bordered by the Atlantic Ocean on the east, the Great Dismal Swamp on the west, and the North Carolina border on the south. The Southern Rivers Watersheds Area contains extensive wetlands, including a variety of rare swamp, pocosin, and marsh communities that drain into Albemarle-Pamlico Sound (Virginia Department of Environmental Quality [VDEQ] 2003).

The Southern Rivers Watershed contains some of the most diverse and extensive wetlands in Virginia. Over 40 rare or endangered species have been documented in the area, which is the highest concentration of special status species for localities located east of the Blue Ridge Mountains (Hampton Roads Planning District Commission 2005). Urbanization within southeastern Virginia has drastically reduced wetland areas from covering 600 mi^2 (1,554 km^2) to only 20 mi^2 (52 km^2). The Southern Rivers Watershed Area also contains some of the last stands of Atlantic white cedar (*Chamaecyparis thyoides*), once prized for use as ship masts because of their straight, tall growth. In 1996, TNC scientists discovered a virgin forest in the watershed, never before recorded in botanical annals, containing cypress (*Taxodium* spp.) and blackgum (*Nyssa sylvatica*) trees that may be as old as 800 years (Hampton Roads Planning District Commission 2005). The Navy conducted Atlantic white cedar restoration work on NSAHR NWA, 1996 to 1999.

NSAHR NWA is located within the Northwest River subwatershed, which encompasses 66,436 ac (26,849 ha). Major land use within the Northwest River subwatershed is farming, forests, and some rural residential land use. The Northwest River is the primary public water supply source for the City of Chesapeake. In the North Carolina portion of the Installation the primary watershed is identified as the Albemarle Watershed (EPA 2014a). NSAHR NWA, via the Natural Resources and Encroachment Action Programs, has formed partnerships and obtained easements to conserve land off Installation property to protect these watersheds and the military mission (Navy 2015b).

The Chesapeake Bay Program Resource Library website (http://www.chesapeakebay.net/library) provides several resources for public use including photographs, maps, datasets, and publications that pertain to the Chesapeake Bay.

All properties of NSAHR fall within the North Atlantic Coastal Plain aquifer system. The Columbia aquifer is the water table or shallow aquifer and includes predominantly sandy surficial deposits that lie above all properties of NSAHR. The Columbia aquifer generally extends from the ground surface to about 20 ft (6 m) below msl. The water table aquifer is vulnerable to contamination by various land uses and is brackish in the area containing all NSAHR properties. The Yorktown-Eastover aquifer is the deeper principal aquifer in the Coastal Plain province (Hampton Roads Planning District Commission 2005). This aquifer includes the predominantly sandy deposits of the Yorktown Formation and the upper part of the Eastover Formation. Freshwater is limited to the upper part of the aquifer, and in some areas, saltwater intrusion has occurred.

NSA HR HQ Complex and NSAHR LRA purchase drinking water from the City of Norfolk. Norfolk's primary water supply comes from eight reservoirs located in Norfolk as well as Suffolk/Isle of Wight County. Additionally, water sources include the Blackwater, and Nottoway Rivers and four deep wells located in Suffolk.

NSAHR PA purchases finished water from the City of Portsmouth. Portsmouth's water supply comes from a system of four surface lakes (Kilby, Meade, Cohoon, and Speight's Run) and five deep wells in the Middle Potomac Aquifer.

Potable water is supplied by a number of deep wells at NSAHR NWA. Well fields are located near the family housing area and the wooded area between Douglas Monroe Road and Relay Road. Recent water quality tests for chemical contaminants did not exceed EPA advisory levels (Vergakis 2019). Water is treated at the NSAHR NWA water treatment plant.

Wetlands

Wetlands survey reports were completed in 2020 for NSAHR HQ Complex, NSAHR LRA, and NSAHR PA and are currently in review. Table 2-5 identifies National Wetlands Inventory wetland types at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA:

Table 2-5. Cowardin Classifications for Wetlands within NSAHR HQ Complex, NSAHR LRA, and NSAHR PA.

Code	NSAHR HQ Complex
PEM1Ed	Palustrine emergent persistent seasonally flooded, Partially drained/ditched
PEM1A	Palustrine Emergent Wetland Persistent Temporary Flooded
PEM1C	Palustrine Emergent Wetland Persistent Seasonally Flooded
PEM1E	Palustrine Emergent Wetland Persistent Seasonally Flooded/Saturated
PFO1C	Palustrine Forested Broad-leaved Deciduous
PFO4Cd	Palustrine Forested Needle-leaved Evergreen Seasonally Flooded, Partially Drained/Ditched
PFO4Ad	Palustrine Forested Needle-leaved Temporary Flooded, Partially Drained/Ditched
PSS1C	Palustrine Scrub-shrub Broad-leaved Deciduous Seasonally Flooded
PEM1Ex	Palustrine emergent Persistent Seasonally Flooded/Saturated, Excavated
PUBHx	Palustrine Unconsolidated Bottom Permanently Flooded, Excavated
R4SBCx	Riverine Intermittent Streambed Seasonally Flooded, Excavated
Code	**NSAHR LRA**
E2USN	Estuarine Intertidal Unconsolidated Regularly Flooded
E2EM1P	Estuarine Intertidal Emergent Persistent Irregularly Flooded
E1UBL	Estuarine Subtidal Unconsolidated Bottom Subtidal
Code	**NSAHR PA**
E2US2P	Estuarine Intertidal Unconsolidated Shores Sand Irregularly Flooded
E1UBL	Estuarine Subtidal Unconsolidated Bottom Subtidal

Source: USFWS 2020a

An installation-wide delineation of NSAHR NWA was completed in May 2012 and data were provided in an appropriate GIS format to the PWD Norfolk, Geo-Readiness Group CNRMA Geo-Readiness Center for incorporation in the base wetlands data layer. A 2012 preliminary jurisdictional determination received from USACE identified 2,203.98 ac (891.92 ha) of wetlands at NSAHR NWA, of which 127.82 ac (51.73 ha) are located in North Carolina (Table 2-6, USACE 2012, and Appendix E). Wetland delineations were completed pursuant to methods outlined in the 1987 Corps of Engineers Wetland Delineation Manual (USACE 1987) and *The Regional Supplement to the Wetland Delineation Manual: Atlantic and Gulf Coastal Plan Region*. Because NSAHR NWA is located within Virginia and North Carolina, it is regulated by two separate USACE districts. The portions of the Installation located within Virginia falls under the jurisdiction of the USACE Norfolk District; while the portion of the Installation within North Carolina falls under the jurisdiction of the USACE Wilmington District. The Norfolk District issued a preliminary jurisdictional determination on 14 September 2012, and the Wilmington District issued a preliminary jurisdictional determination on 28 November 2012 (Appendix E). Reissued preliminary jurisdictional determinations received from USACE in 2018 identified 2,893.67 ac (1,171.03 ha) of wetlands at NSAHR NWA, of which 835.90 ac (338.28 ha) are located in North Carolina (Appendix E. Under the preliminary jurisdictional terms all delineated wetlands and waterbodies are assumed jurisdictional and regulated by the CWA. Activities involving the discharge of dredged or fill material, including those associated with mechanized land clearing, into these areas would require a USACE permit, Virginia Water Protection Permit from the VDEQ, and/or a permit from the Virginia Marine Resources Commission (VMRC), and/or a permit from NCDENR, Division of Water Resources, Water Quality Programs, Wetlands

Branch. The preliminary jurisdictional determination may be used with USACE permit applications if impacts to these aquatic resources cannot be avoided.

The 2012 wetland delineation classified NSAHR NWA wetlands according to the Cowardin classification of wetlands and deepwater habitats (Cowardin et al. 1979), which groups wetlands into five major systems: marine, estuarine, riverine, lacustrine, and palustrine. Marine systems consist of the open ocean and its associated coastline. Estuarine systems are those that are periodically flooded with tidally influenced salty or brackish waters and have salinity greater than 0.5 parts per thousand (ppt). The lacustrine system includes areas of open water that are greater than 20 ac (8 ha) or deeper than 6.6 ft (2.0 m) at low water. Palustrine wetlands are nontidal vegetated wetlands or open-water habitats less than 20 ac (8 ha) or 6.6 ft (2.0 m) deep that have salinity less than 0.5 ppt. 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. Palustrine and riverine are the only two wetland systems found at NSAHR NWA.

The most common wetland types present at NSAHR NWA are palustrine, emergent/palustrine forested (1,624.60 ac or 657.45 ha), palustrine forested (438.11 ac or 117.30 ha), palustrine forested/palustrine scrub-shrub (122.14 ac or 49.43 ha), and palustrine scrub-shrub (12.42 ac or 5.03 ha) (see Table 2-6). Each of the remaining wetland types comprised less than 2 ac (0.81 ha).

Table 2-6. Wetlands Summary of NSAHR NWA.

Code	Cowardin Classification	Acres
PEM/PFO	Palustrine emergent/palustrine forested	1,624.60
PFO	Palustrine forested	438.11
PFO/PSS	Palustrine forested/palustrine scrub-shrub	122.14
PSS	Palustrine scrub-shrub	12.42
PEM/PSS	Palustrine emergent/palustrine scrub-shrub	1.54
POW/PFO	Palustrine open water/palustrine forested	1.43
Not Applicable	Farmed wetland (emergent wetland or standing water located in farmed agricultural field	1.42
PSS/PEM	Palustrine scrub-shrub/palustrine emergent	1.13
POW/PSS	Palustrine open water/palustrine scrub-shrub	0.55
PFO/PEM/PSS	Palustrine forested/palustrine emergent/palustrine scrub-shrub	0.14
POW	Palustrine open water	0.05
PFO/PEM	Palustrine forested/palustrine emergent	0.04
Not Applicable	Depressional wetland with stained leaves	0.02
	Total wetlands	**2,203.59**

NA = Not Applicable
Source: Cowardin et al. 1979 and USACE 2012

2.8 General Biotic Environment

2.8.1 Flora

Ecological communities of Virginia are classified and ranked using the third approximation (Version 3.4) of a natural community classification system developed by VDCR-DNH (Fleming and Patterson 2017). North Carolina classifies natural communities using the Fourth Approximation, which focuses on types and subtypes that represent a scale at which biodiversity conservation should be addressed (NCNHP 2012). Much of the land at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA is urban lands; no formal floristic surveys have been conducted at these installations. The majority of the vegetation at these properties is urban vegetation; however common reed *(Phragmites australis*) habitat does occur at NSAHR HQ Complex (Figure 2-13, Section 2.8.1.1).

At the time of acquisition by the U.S. government, much of the land at NSAHR NWA had been cleared and drained for agriculture, and most of the remaining forested areas had been harvested repeatedly over the past 250 years. These past land uses and the extensive ditching required to support them, along with several catastrophic wildfires that burned various parts of the Great Dismal Swamp, have altered the natural ecological communities of Atlantic white cedar and bald cypress (*Taxodium distichum*) that were once prevalent in the area. Only a few small, remnant patches of these communities occur on NSAHR NWA today and are generally mixed with more abundant species such as red maple (*Acer rubrum*) and loblolly pine (*Pinus taeda*).

Although highly disturbed, the flora of NSAHR NWA is diverse and includes six identified broad ecological community groups (Schafale and Weakley 1990, and Fleming and Patterson 2017). This classification system is intentionally broad and often includes several specific associations within each ecological community. Four relatively natural forested communities (mesic mixed hardwoods, non-riverine swamp forests, non-riverine pine-hardwood forests, and Coastal Plain/Piedmont bottomland forests) and planted and naturally occurring loblolly pine stands have been identified at NSAHR NWA. Managed pine stands are not recognized as a naturally occurring ecological community in the VDCR-DNH or North Carolina Natural Heritage Program (NHP) classification systems. In addition to the forested areas, NSAHR NWA also has a large area of old field and early successional communities. Table 2-7 lists the forested cover types identified at NSAHR NWA and their respective acreages, and Figure 2-14 illustrates their respective locations and abundance. General community descriptions for these various cover types are presented in the following subsections.

Table 2-7. Ecological Communities and Other Cover Types of NSAHR NWA.

Community Type	Acres
Loblolly Pine	927
Non-Riverine Swamp Forest	476
Non-Riverine Flatwoods and Swamps	427
Mesic Mixed Hardwood Forest	407
Early Successional Communities	299
Coastal Plain Piedmont Bottomland Forest	79
Total	**2,615**

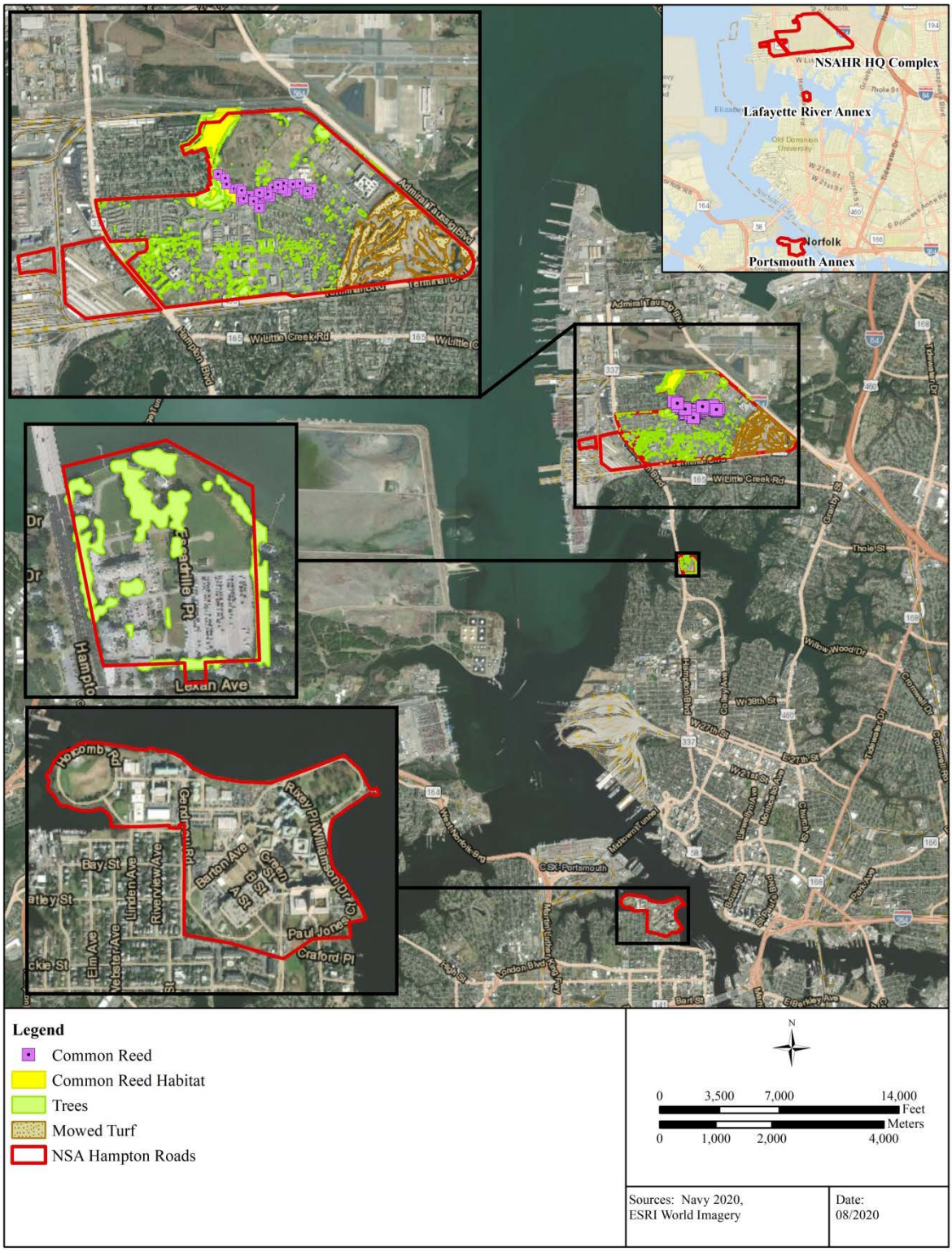

Figure 2-13. Ecological Communities of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA.

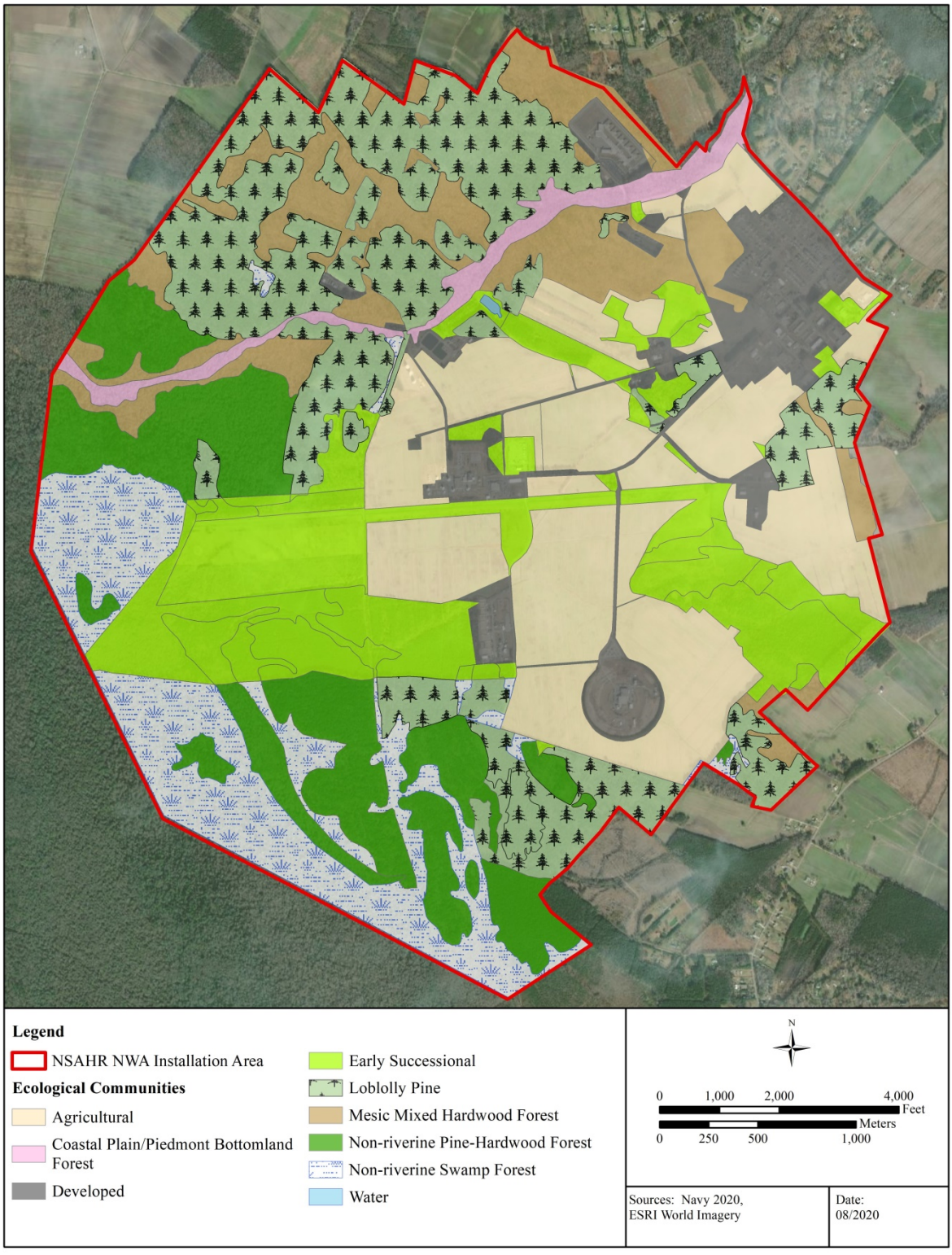

Figure 2-14. Ecological Communities of NSAHR NWA.

A vegetative community survey was conducted at NSAHR NWA in July and August 2013. Vegetation plot data were collected to the association level according to the U.S. National Vegetation Classification Standard. Additional vegetation surveys were conducted in 2018 during Natural Heritage Inventory (NHI) and milkweed surveys; three Significant Ecological Communities previously identified at NSAHR NWA were identified and assessed: southern coastal plain mesic mixed hardwood forest, non-riverine wet hardwood forests, and non-riverine swamp forests (GMI AECOM 2019).

2.8.1.1 Ecological Communities

No surveys for ecological communities have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Vegetation surveys were conducted in 2018 during Natural Heritage Inventory (NHI) and milkweed surveys; three Significant Ecological Communities previously identified at NSAHR NWA were identified and assessed: southern coastal plain mesic mixed hardwood forest, non-riverine wet hardwood forests, and non-riverine swamp forests, and (GMI AECOM 2019).

Coastal Plain/Piedmont Bottomland Forests

Coastal Plain/Piedmont bottomland forests are a diverse group of temporarily and seasonally flooded forests, encompassing most bottomland sites of the Coastal Plain, except those occupied by bald cypress–tupelo forests. Characteristic tree species vary with habitat conditions. Seasonally flooded swamps are usually dominated by combinations of green ash (*Fraxinus pennsylvanica*), red maple, sweetgum, swamp tupelo, water hickory (*Carya aquatica*), willow oak (*Quercus phellos*), and overcup oak (*Q. lyrata*). Well drained levees support swamp chestnut oak (*Quercus michauxii*), cherrybark oak, laurel oak, sugarberry (*Celtis laevigata*), and American elm (*Ulmus americana*). Swamp cottonwood (*Populus heterophylla*) and river birch (*Betula nigra*) are often abundant in disturbed, cut-over stands. 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. On exceptionally well drained small stream bottoms, tulip-poplars are often observed. Small tree, shrub, and herbaceous compositions are highly variable depending on geography and site conditions.

Common Reed Habitat

Common reed is a perennial wetland grass ranging in height from 3-13 ft (1-4 m). The species is characterized by strong leathery horizontal rhizomes growing on or beneath the ground surface that produce roots and strong vertical stalks. Common reed thrives in sunny wetland habitats and grows along drier margins and elevated areas of salty and freshwater marshes, as well as along riverbanks and lakeshores. The species is predominantly widespread in disturbed or polluted soils along roadsides, ditches, and dredged areas.

Early Successional Communities

NSAHR NWA has several areas with early successional communities, which increase diversity and add an important habitat component for many wildlife species. Included are areas that were previously harvested or cleared and are in a scrub-shrub stage or areas that are maintained through periodic mowing or prescribed fire. Sites that were previously cleared, and either replanted with

loblolly pine or allowed to revegetate naturally are regenerating as mixed pine-hardwood stands, usually with extremely dense giant cane thickets initially. In the absence of fire or further disturbance, a tree canopy will begin to shade the giant cane, which will thin out and open up the understory, allowing new species to become established. Loblolly pine, sweetgum, and red maple dominate the tree/sapling layer. These areas are not of great value as producers of food; however, they offer excellent cover for a variety of wildlife.

The antenna clear zones and fallow agricultural fields provide old field habitat, another ecological community that occurs at NSAHR NWA. These areas are manually cleared or burned approximately once per year, though the time period between clearing events can reach several years. Several of these areas are comprised of extensive stands of giant cane. In the abandoned agricultural fields, the drainage ditch system is not being maintained, and those fields are now establishing healthy stands of emergent marsh-type vegetation. These areas provide habitat for species that prefer non-forested landscapes. 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.

Mesic Mixed Hardwood Forests

Mesic mixed hardwood forests are forests of mesic to submesic, infertile habitats occurring throughout the Coastal Plain and Piedmont. Forests in this group occupy mesic uplands, ravines, lower slopes, and well drained flatwoods on acidic, relatively nutrient-poor soils. The most typical tree canopies contain mixtures of American beech (*Fagus grandifolia*), oaks (*Quercus* spp., varying by region), tulip poplars (*Liriodendron tulipifera*), and hickories (*Carya* spp.), but a wide variety of hardwood associates may occur. American hornbeam (*Carpinus caroliniana*), flowering dogwood (*Cornus florida*), and American holly (*Ilex opaca*) are prominent understory plants. In mesic flatwoods of the southeastern Virginia Coastal Plain, silky camelia (*Stewartia malacodendron*) and big-leaf snowbell (*Styrax grandifolia*) are characteristic small trees. These communities lack the lush herbaceous layers of rich mixed hardwood forests. The name “Southern Mixed Hardwood Forest” has often been applied to Coastal Plain representatives of this group.

Non-Riverine Swamp Forests

Non-riverine swamp forests are identified as communities of concern and are seasonally flooded mixed or deciduous forests occurring on poorly drained peatlands of the Coastal Plain. These communities are most abundant on terraces of the embayed region of extreme southeastern Virginia and northeastern North Carolina; though they occasionally occur further inland. These communities contain non-riverine wetland flats with deep or shallow organic soils and seasonal flooding to depths of 12 in (30 cm) by elevated water tables. Hummock-and-hollow microtopography is typical. Dominant trees include bald cypress, swamp tupelo (*Nyssa biflora*), and red maple. Red maple now dominates most stands because of extensive past logging, catastrophic fires, and ditching. Swamp bay (*Persea palustris*) and coastal sweet pepperbush (*Clethra alnifolia*) are abundant in the lower woody layers. Also abundant are high-climbing vines of greenbriers (*Smilax* spp.), eastern poison ivy (*Toxicodendron radicans*), woodvamp (*Decumaria barbara*), Virginia creeper (*Parthenocissus quinquefolia*), and muscadine (*Vitis rotundifolia*). Netted chain fern (*Woodwardia areolata*) and Virginia chain fern (*W. virginica*) are among the few herbs that occur regularly. Non-riverine swamp forest is the characteristic vegetation in and near the Great Dismal Swamp in Virginia.

NHI surveys in 2018 described the non-riverine swamp forests at NSAHR NWA as dry with presence of switch cane (*Arundinaria tecta*), which may occur as a result of hydrological alterations caused by large-scale ditching. Previous fires that burned through peat soils in these areas may have also caused drier conditions (GMI AECOM 2019).

Non-Riverine Flatwoods and Swamp

Non-riverine flatwoods and swamps are saturated mixed forests of poorly drained, outer Coastal Plain terraces. In Virginia, these communities are extensive from Surry and Isle of Wight counties, south to the city of Suffolk on the west and the North Landing River (City of Virginia Beach) on the east. The habitats are flat, with seasonally perched water tables and frequent shallow depressions that pond water intermittently. Soils are silt, sand, and clay loams, often with a thin (12-in [30-cm]) organic mantle. The prevalent vegetation of these flatwoods is dominated by mixtures of loblolly pine, red maple, and sweetgum (*Liquidambar styraciflua*), frequently with scattered pond pine (*Pinus serotina*). Small trees and shrubs include sweetbay magnolia (*Magnolia virginiana*), blackgum, swamp bay, and coastal doghobble (*Leucothoe axillaris*). South of the James River, giant cane (*Arundinaria gigantea*) typically dominates the shrub layer in patchy to very dense colonies. Herbaceous species are sparse. Forests of this composition appear to be successional stands that have replaced once-extensive "canebrakes" following the elimination of fire in the region. Similar communities may have replaced non-riverine wet hardwood forests and Atlantic white cedar forests following heavy cutting or catastrophic fires. Several rare species, including the globally rare Virginia least trillium (*Trillium pusillum* var. *virginianum*) and large populations of the state-rare Swainson's warbler (*Limnothlypis swainsonii*), are associated with non-riverine pine-hardwood forests.

Pine Plantations

Concentrated reforestation efforts and natural regeneration of the abandoned agricultural lands have occurred widely throughout NSAHR NWA. Loblolly pine was the primary species planted on the abandoned agricultural lands. It is now one of most dominant species on the Installation and occurs in relatively pure stands as well as mixed stands with other pines and hardwoods. Loblolly pine stands occur as even-aged stands with individual stands ranging in age from less than 10 years old to more than 70 years old. In drier areas, the understory in these stands is commonly comprised of the invasive Japanese honeysuckle (*Lonicera japonica*), eastern poison ivy, blackberry (*Rubus* spp.), trumpet creeper (*Campsis radicans*), and Virginia creeper. Sweetgum, red maple, and tulip-poplar are frequently found in the mid canopy. In wet areas, the understory of the loblolly pine stands is more often comprised of giant cane, coastal sweet pepper-bush, roundleaf greenbrier (*Smilax rotundifolia*), and highbush blueberry.

2.8.1.2 Significant Ecological Communities

No surveys for Significant Ecological Communities have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Vegetation surveys at NSAHR NWA were conducted in 2018 during Natural Heritage Inventory (NHI) and milkweed surveys; three Significant Ecological Communities previously identified at NSAHR NWA were identified and assessed: southern coastal plain mesic mixed hardwood forest, non-riverine wet hardwood forests, and non-riverine swamp forests, and (GMI AECOM 2019). As defined by Van Alstine et al. (2003), Significant

Ecological Communities represent outstanding examples of common ecological communities or examples of rare ecological communities as indicated by their global conservation rank.

Southern Coastal Plain Mesic Mixed Hardwood Forest

This mesic mixed hardwood forest is considered a community of concern and occurs on deep, acidic, relatively nutrient-poor soils. The typical canopy stratum of this community includes mixtures of American beech, oaks (e.g., *Quercus alba* and *Q. falcata*) in drier zones, tulip-poplar, and hickories (*Carya* spp.). However, a diverse assemblage of other hardwood associate plant species may also occur. The understory is diverse and contains musclewood (*Carpinus caroliniana),* flowering dogwood (*Cornus florida*), American strawberry-bush (*Euonymus americanus*), American holly, hophornbeam (*Ostrya virginiana*), silky camellia, and sweetleaf. Herbaceous vegetation layers range from sparse to moderately developed and may include cinnamon fern (*Osmunda cinnamomea*), Christmas fern (*Polystichum acrostichoides*), New York fern (*Parathelypteris noveboracensis*), downy rattlesnake-plantain (*Goodyera pubescens*), Virginia heartleaf (*Hexastylis virginica*), and partridge-berry (*Mitchella repens*).

NHI surveys performed in 2018 identified a gradation of Southern Coastal Plain Mesic Mixed Hardwood Forest in the northern part of NSAHR NWA. Although American beech was not identified in the area, other diagnostic species such as silky camellia were observed (GMI AECOM 2019).

Non-Riverine Wet Hardwood Forest

Non-riverine wet hardwood forest occurs on extensive interstream flats with fine-textured mineral soils. Hydrology is seasonally to nearly permanently saturated, with occasional ponding. The canopy of stands of this type is dominated by swamp chestnut oak, cherrybark oak (*Quercus pagoda*), laurel oak (*Q. laurifolia*), sweetgum (especially in logged examples), water oak, and American beach (on mesic microsites). Typical understory species are musclewood, paw paw, American holly (*Ilex opaca*), sweetbay magnolia and red maple. The shrub layer is often dense, and typically contains species such as sweet pepperbush and coastal doghobble as dominants. Southern highbush blueberry (*Vaccinium formosum*), Virginia sweetspire (*Itea virginica*), fetterbush (*Eubotrys racemosa*), spicebush (*Lindera benzoin*), and switch cane are also often present. The Non-riverine Wet Hardwood Forest type is distinguished by the dominance or substantial presence of bottomland oaks in sites remote from rivers and not subject to overland flooding. The dominance of the shrub layer by sweet pepperbush and coastal doghobble also distinguishes them from other bottomland hardwoods.

2.8.1.3 Invasive Plant Species

Many aggressive, nonnative plant species that have been used in agriculture, erosion control, as ornamentals, or were accidentally introduced have become problematic weed species that are now considered a leading threat to native habitats.

No invasive plant species inventories have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA; however common reed has been documented within NSAHR HQ Complex (Figure 2-13). An invasive plant species inventory survey was conducted at NSAHR NWA in 2013 using an adaptive survey methodology with on-the-ground surveys and global position system data recording the location and presence/absence of invasive plant species (NAVFAC Mid-Atlantic

2014). A total of 320 plots were surveyed for their invasive species community composition with approximately 492-ft (150-m) plot spacing. Seventeen invasive plant species were identified during these surveys: Japanese honeysuckle, Japanese stilt grass (*Microtstegium vimineum*), Chinese privet (*Ligustrum sinense*), mimosa (*Mimosa* spp.), Johnson-grass (*Sorghum halepense*), Chinese wisteria (*Wisteria sinensis*), common reed, autumn olive (*Elaeagnus umbellata*), Chinese lespedeza (*Lespedeza cuneata*), common dayflower (*Commelina communis*), creeping liriope (*Liriope spicata*), lily turf (*L. muscari*), English ivy (*Hedera helix*), golden bamboo (*Phyllostachys aurea*), multiflora rose (*Rosa multiflora*), porcelain berry (*Ampelopsis brevipedunculata*), and shrubby bushclover (*Lespedeza bicolor*). Alligator weed (*Alternanthera philoxeroides*) was not recorded in any of the survey plots but is known to occur on NSAHR NWA. Asian spiderwort (*Murdannia keisak*) was also identified on NSAHR NWA during invasive species control treatments (Navy 2018a). The following sections provide additional details on invasive species documented at NSAHR NWA: common reed, Japanese honeysuckle, Japanese stilt grass, and Chinese privet, alligator weed, golden bamboo, and Asian spiderwort.

Alligator Weed

Alligator weed is a native species to South America that is a sprawling plant commonly found at surfaces of water bodies, as well as areas around gardens and between rows of crops where ideal moisture conditions occur. Alligator weed stems are pink and hollow and can reach lengths of 3.3 ft (1 m), and flowers are typically white with thin petals that extend 4-5 in (10-13 cm) away from the plant. The species is difficult to eradicate since it can spread and reproduce at rapid rates through stems or leaf cuttings. Alligator weed was a target species of invasive species control efforts at NSAHR NWA (Section 4.8.2; Navy 2018a).

Asian Spiderwort

Asian spiderwort is a native species to eastern Asia that is invasive in the wild in the southeastern U.S. The species is a low growing, sprawling, herbaceous plant found in damp soils near water bodies. Asian spiderwort has stems between 12-30 in (30-76 cm) long, lance-shaped leaves that are 1-3 in (2.5-7.5 cm) long, and flowers that consist of three pink to violet petals. The species outcompetes native plants by forming dense mats that grow rapidly. Asian spiderwort was a target species of invasive species control efforts at NSAHR NWA (Section 4.8.2; Navy 2018a).

Chinese Privet

Chinese privet is a deciduous tree or shrub that typical grows up to 7 ft (2 m) tall. It is used for ornamental plantings and has spread throughout the southeastern U.S. where it has become naturalized. New plants can grow from seeds, as well as from root and stump sprouts. The seeds are eaten and spread by birds and other wildlife.

During the 2013 invasive species survey, Chinese privet was documented in 26 plots (8%). Most of the occurrences were in the northern portion of the Installation, with additional plots containing Chinese privet in the eastern portion. Most occurrences were found along habitat edges (NAVFAC Mid-Atlantic 2014).

Common Reed

One of the primary invasive plant species of concern at NSAHR NWA is common reed. Common reed is a large, invasive perennial grass that can be found throughout the U.S. It grows quickly and forms extensive, and often monotypic, stands that can overwhelm other wetland species. Common spreading mechanisms or vectors have been attributed to nutrient enrichment and an increase in soil disturbance associated with coastal development. It also can be a significant problem in freshwater systems and is difficult to eradicate once it becomes established.

Aerial spraying of common reed populations at the Installation with Rodeo herbicide was initiated in 2006, and Installation populations were mapped at NSAHR NWA in 2008. In October 2011 an estimated 30 ac (12 ha) were sprayed with Rodeo Herbicide (Figure 2-15). Aerial spraying of common reed conducted at the Installation between 2006 and 2011 was covered by an EA prepared for invasive species spraying events conducted at Navy installations located within the Hampton Roads region, which targeted common reed and kudzu. As a result of these surveys, common reed was a target species of invasive species control efforts at NSAHR NWA (see Section 4.10; Navy 2018a).

For the 2013 invasive species survey, areas containing common reed were of particular interest to NSAHR NWA, so a specialized survey methodology was implemented when common reed populations were identified that exceeded a 16-ft (5-m) radius plot size. For stands of common reed that exceed the 16-ft (5-m) radius plot size, polygon data was collected. During the 2013 invasive species survey, 14 populations (or stands) of common reed, totaling 14.9 acres (6.0 hectares) were recorded at NSAHR NWA (NAVFAC Mid-Atlantic 2014); although additional stands not mapped during this survey effort likely increase this acreage to approximately 30 ac (12 ha). Each population was mapped as a polygon, as all stands observed exceeded the 16-ft (5-m) radius plot size.

Figure 2-15. 2011 Common Reed Treatment Locations at NSAHR NWA.

Golden Bamboo

Golden bamboo is a native species to southeast China that is invasive to the southeastern U.S. The species can reach a height of 30-40 ft (9-12 m), has lanceolate-shaped leaves approximately 6 in (15 cm) long. Golden bamboo spreads rapidly through rhizomes and culms that grow from side shoots. The species was a target species of invasive species control efforts at NSAHR NWA (Section 4.8.2; Navy 2018a).

Japanese Honeysuckle

Japanese honeysuckle is a species of vine or bush that can quickly spread via tiny fruit seeds. Japanese honeysuckle is often sold in nurseries due to its ability to act as an effective ground cover and because it has strong sweet-smelling flowers. However, it can overwhelm and/or displace native plants. Common spreading mechanisms or vectors include birds and other wildlife that consume the fruits and then disperse the seeds. It can also spread vegetatively.

During the 2013 invasive species survey, Japanese honeysuckle was the most abundant of any invasive plant species identified, occupying 204 plots (64%), and was widely distributed across the Installation (NAVFAC Mid-Atlantic 2014).

Japanese Stilt Grass

Japanese stilt grass is an annual grass that is common throughout many types of habitats, including along roads, floodplains and other disturbed areas. Japanese stilt grass was accidentally introduced in the early 1900s and has since spread throughout the southeastern U.S. Its invasive nature suppresses growth of native plant communities, alters insect communities, and slows plant succession, thereby altering nutrient cycling. Its dominance is promoted by local deer populations that feed on native species but avoid Japanese stilt grass, reducing competition for this invasive species.

During the 2013 invasive species survey, Japanese stilt grass occupied 85 plots (27%). It was distributed widely across the Installation, often along habitat edges or roads and was widespread among the forested tracts (NAVFAC Mid-Atlantic 2014).

2.8.2 Fauna

The fauna of NSAHR is diverse and is generally representative of the natural areas of southeastern Virginia and northeastern North Carolina. There have been no species inventories performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA and the abundance of available habitat at these properties is low; however, a list of the 495 species that may potentially be observed within the region of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA can be found in Appendix F. Within NSAHR NWA, the variety of available habitats, extensive area of contiguous forest, and abundance of wetlands allow for a diverse assemblage of wildlife species. Several general inventories and studies of specific taxa have been conducted at NSAHR NWA to assess species occurrences and provide information for fish and wildlife management (Belden 1993, McCoy and Schwab 2000, Navy 1998a, Pinder 1997, Rose et al. 1988, Savitzky and Petersen 2001, Savitzky and Petersen 2004, Schwab 2003a, Schwab 2003b, USFWS 1977, USFWS 1987, and USFWS 1995). Results of these studies have been compiled into cumulative species lists (Appendix F) and are summarized in the following sections. Fauna considered rare, threatened, or endangered at the

state or federal level that occur or have the potential to occur at NSAHR NWA are described in Section 2.8.3.

2.8.2.1 Birds

There have been no avian surveys performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. The avifauna of NSAHR NWA is comprised of forest, woodland, and old field habitat species. Due to the general lack of open-water habitat, relatively few water birds occur. The list of bird species (Appendix F) includes the 110 species that have been observed at NSAHR NWA to date. In addition, a new bird survey was completed in 2019 and a report was completed in 2020. Forest and woodland bird species, however, are often difficult to observe, and this list should not be considered comprehensive.

NSAHR NWA's large area of contiguous forestland provides important habitat to a large number of Neotropical migratory bird species that require this habitat for breeding purposes. Thrushes, warblers, flycatchers, and woodpeckers are groups of birds that largely rely on extensive forested tracts for meeting their habitat requirements. Commonly encountered birds from these groups include the brown thrasher (*Toxostoma rufum*), gray catbird (*Dumetella carolinensis*), wood thrush (*Hylocichla mustelina*), ovenbird (*Seiurus aurocapilla*), common yellowthroat (*Geothlypis trichas*), prothonotary warbler (*Protonotaria citrea*), pine warbler (*Setophaga pinus*), northern parula (*Setophaga americana*), hooded warbler (*Setophaga citrina*), Carolina chickadee (*Poecile carolinensis*), Carolina wren (*Thryothorus ludovicianus*), tufted titmouse (*Baeolophus bicolor*), blue-gray gnatcatcher (*Polioptila caerulea*), ruby-crowned kinglet (*Regulus calendula*), red-eyed vireo (*Vireo olivaceus*), white-eyed vireo (*Vireo. griseus*), white-breasted nuthatch (*Sitta carolinensis*), eastern wood peewee (*Contopus virens*), great crested flycatcher (*Myiarchus crinitus*), eastern kingbird (*Tyrannus tyrannus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), red-bellied woodpecker (*Melanerpes carolinus*), and northern flicker (*Colaptes auratus*). A few representative large birds that breed in these forests are the sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter. cooperii*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), barred owl (*Strix varia*), eastern screech owl (*Megascops easio*), great horned owl (*Bubo virginianus*), American woodcock (*Scolopax minor*), wood duck (*Aix sponsa*), American crow (*Corvus brachyrhynchos*), eastern wild turkey (*Meleagris gallopavo silvestris*), and pileated woodpecker (*Dryocopus pileatus*).

Regenerating clear-cuts, maintained old fields, and other open habitats on NSAHR NWA are utilized by many different species of birds. Most of the species are migratory, though some are year-round residents. Commonly encountered species in these habitats include the eastern bluebird (*Sialia sialis*), northern mockingbird (*Mimus polyglottos*), common grackle (*Quiscalus quiscula*), brown-headed cowbird (*Molothrus ater*), white-throated sparrow (*Zonotrichia albicollis*), song sparrow (*Melospiza melodia*), indigo bunting (*Passerina cyanea*), house finch (*Haemorhous mexicanus*), northern bobwhite (*Colinus virginianus*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), eastern meadowlark (*Sturnella magna*), American goldfinch (*Spinus tristis*), American crow, turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), red-tailed hawk, American robin (*Turdus migratorius*), cattle egret (*Bubulcus ibis*), European house sparrow (*Passer domesticus*), and European starling (*Sturnus vulgaris*).

Open-water habitat on NSAHR NWA is associated with drainage ditches, Mill Stream, and Lunker Lake. Species that may be encountered along the edges of the open water, wading the shallows, or swimming include pied-billed grebe (*Podilymbus podiceps*), wood duck, mallard (*Anas platyrhynchos*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), green-backed heron (*Butorides striata*), belted kingfisher (*Megaceryle alcyon*), solitary sandpiper (*Tringa solitaria*), spotted sandpiper (*Actitis macularia*), greater yellowlegs (*Tringa melanoleuca),* and red-winged blackbird (*Agelaius phoeniceus*).

A DoD Coordinated Bird Monitoring (DoD CBM) Avian Species List Study for NSAHR NWA was conducted in 2013, and an additional survey was completed in 2019; results from the 2019 survey were not yet available during the current INRMP update. NHI and milkweed surveys in 2018 at NSAHR NWA identified nine species of state-listed birds. These species are listed in section 2.8.3.

2.8.2.2 Fish

No fish species inventories have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Since little open-water habitat is available on NSAHR NWA, the number and diversity of fish are relatively low. Available habitat is confined to the drainage canals with semipermanent water, channelized streams, remnant portions of Bass Pond, and Lunker Lake. The drainage canals with semipermanent water contain populations of mosquitofish (*Gambusia affinis*). Mill Stream has a low-flow volume under normal conditions and has only scattered pools that exceed 2 ft (1 m) in depth. Its connection off Installation with the Northwest River permits migration of some fish species. Mill Stream (Figure 2-12) was surveyed in 1995 by USFWS personnel using backpack electroshocking equipment (USFWS 1995). A total of nine fish species was collected: bluespotted sunfish (*Enneacanthus gloriosus*), warmouth (*Lepomis gulosus*), pumpkinseed (*L. gibbosus*), pirate perch (*Aphredoderus sayanus*), eastern mudminnow (*Umbra pygmaea*), tessellated darter (*Etheostoma olmstedi*), American eel (*Anguilla rostrata*), creek chubsucker (*Erimyzon oblongus*), and golden shiner (*Notemigonus crysoleucas*). A migratory fisheries assessment of Mill Stream conducted in 2013 confirmed the presence of American eel, creek chubsucker, bluespotted sunfish, pirate perch, warmouth, and eastern mudminnow. Four additional fish species were identified in Mill Stream, including redfin pickerel (*Esox americanus*), redear sunfish (*Lepomis microlophus*), bluegill (*Lepomis macrochirus*), bowfin (*Amia calva*), and mosquitofish (Navy 2014b). Lunker Lake and Bass Pond, which have no inlet or outlet, have fish populations that reflect stockings that occurred under an earlier fisheries management program. Past fish sampling in Lunker Lake and Bass Pond have documented largemouth bass (*Micropterus salmoides*), bluegill, redear sunfish, white catfish (*Ictalurus catus*), golden shiner, mosquitofish, black crappie (*Pomoxis nigromaculatus*), and American eel (USFWS 1977 and USFWS 1987). A recreational fisheries assessment of Lunker Lake conducted in 2013 confirmed the presence of largemouth bass, bluegill, American eel, redear sunfish, and mosquitofish (Navy 2014b). NHI and milkweed surveys performed at NSAHR NWA in 2018 identified only two species of fish, the eastern mud minnow (*Umbra pygmaea*) and bluespotted sunfish (*Enneacanthus gloriosus*) (GMI AECOM 2019).

2.8.2.3 Herpetofauna

No herpetofauna (amphibians and reptiles) surveys have been conducted at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. The extensive area of upland and wetland habitats on and adjacent to NSAHR NWA provides abundant habitat for herpetofauna and the assemblage of these groups are diverse and abundant. Of the 70 species/subspecies with the potential to occur on the installation, 58 have been confirmed present (Chris Petersen, personal communication). Various surveys for herpetofauna have documented 17 species of frogs and toads, 7 salamanders, 9 turtles, 4 lizards, and 21 snakes (Appendix F). Habitat types occupied by herpetofauna on NSAHR NWA include clear-cuts, hardwood and pine forests, and wetlands (Lunker Lake, ditches, and streams). Some species are even found in cantonment areas of the installation.

Spring peeper (*Pseudacris crucifer)*

Photo Credit: Chris Petersen

Common frogs and toads that occur at NSAHR NWA are the southern leopard frog (*Lithobates sphenocephalus*), green frog (*Lithobates clamitans*) green treefrog (*Hyla cinerea*), Cope's gray treefrog (*Hyla chrysoscelis*), spring peeper (*Pseudacris crucifer*) and southern toad (*Anaxyrus terrestris*). These species are common around Lunker Lake, the Mill Stream, and the southwestern area of the ROTHR antenna clear zone. Use of acoustic recorders documented frog and toad species at two locations on the installation in 2016 and 2017 (see Anuran Acoustic Recorder Survey reports 2016 and 2017). During the 2017 acoustic recorder survey, the Mid-Atlantic coast leopard frog (*Lithobates kauffeldi*) was documented on the installation for the first time. This species was first described by herpetologists in 2012. Other efforts to document the anuran species on the installation include monitoring Lunker Lake as an official FrogWatch USA (https://www.aza.org/frogwatch) survey site during 2015 and 2016.

Common salamander species confirmed present on NSAHR NWA include the red-spotted newt (*Notophthalmus viridescens viridescens*), Atlantic coast slimy salamander (*Plethodon chlorobryonis*), marbled salamander (*Ambystoma opacum*), and eastern red-backed salamander (*Plethodon cinereus*). These species can be found within both the upland and wetland forested habitats of the installation, typically under logs and leaf litter. In 2019, several two-toed amphiuma (*Amphiuma means*) were captured in turtle traps placed in the ROTHR antenna clear cut and the ditch that parallels the antenna road.

Marbled salamander (*Ambystoma opacum)*

Photo Credit: Mundy Hackett

The woodland (formerly eastern) box turtle (*Terrapene carolina carolina*) is one of the most commonly encountered turtle species on the installation in upland habitats. Lunker Lake and other permanent and ephemeral bodies of water contain snapping turtles *(Chelydra serpentina*), eastern painted turtle (*Chrysemys picta picta*), yellow-bellied slider (*Trachemys scripta scripta)* and the nonnative red-eared slider (*Trachemys scripta elegans*) and northern red-bellied cooter (*Pseudemys rubriventris*), which is currently under review by the USFWS for federal protection under the ESA. Surveys for spotted turtles (*Clemmys guttata*), a species that is also currently under review by the USFWS for listing under the ESA, were conducted by the Smithsonian Institute in the spring of 2019. This survey documented the species at three locations on the installation. Radio-telemetry surveys were also conducted on this species to investigate their movement patterns in the late 1990's (Chris Petersen, personal communication).

Woodland box turtle (*Terrapene carolina Carolina)*

Photo Credit: Paul Block

Spotted turtle (*Clemmys guttata)*

Photo Credit: Chris Petersen

Of the four lizard species confirmed present on the installation, the common five-lined skink (*Eumeces fasciatus*), and little brown skink (*Scincella lateralis*) are frequently encountered in forested habitats and cantonment areas of the base. The eastern fenced lizard (*Sceloporus undulatus*) has the potential to occur on the Installation but has never been confirmed present.

Little brown skink (*Scincella lateralis*)

Photo Credit: Chris Petersen

Snakes are the most diverse herpetofauna species group on NSAHR NWA (21 species). Frequently encountered snake species include the northern black racer (*Coluber constrictor constrictor*), ring-necked snake (*Diadophis punctatus*), eastern rat snake (*Pantherophis alleghaniensis*), eastern hog-nosed snake (*Heterodon platirhinos*), plain-bellied watersnake (*Nerodia erythrogaster*), and eastern garter snake (*Thamnophis sirtalis sirtalis*).

Venomous species confirmed present include the copperhead (*Agkistrodon contortrix*) and the canebrake rattlesnake (*Crotalus horridus*). Despite numerous survey efforts, the eastern cottonmouth (*Agkistrodon piscivorus*) has never been documented on the installation; however, one was found dead on Ballahack Road adjacent to the base perimeter (Chris Petersen, personal communication) so their presence is possible.

The canebrake rattlesnake is the largest snake on NSAHR NWA (and in Virginia) and individuals of approximately five feet in length have been documented on the base. Although this species is venomous, they are not aggressive and only rattle their tails and strike when provoked. The canebrake rattlesnake (Coastal Plain population of the timber rattlesnake) was listed as a state endangered species on 1 January 1992 (VR 325-01-1 & 13) and is afforded official protection under Article 6, Title 29.1 of the Code of Virginia (2011 Canebrake Rattlesnake Conservation Plan). Therefore, it is unlawful to possess, harm, harass or kill this species. The movement patterns, habitat use, diet and life history of canebrakes have been extensively studied on NSAHR NWA resulting in detailed knowledge of this species on the installation (Savitzky and Petersen 2001; Savitzky and Goetz 2009; Goetz et al. 2016; Petersen et al. 2019). Maintaining a healthy population of this species on NSAHR NWA and the adjacent Virginia Department of Wildlife Resources (formerly the Virginia Department of Game and Inland Fisheries) Cavalier Wildlife Management Area is a high priority of the installation as it is critical to the survival of this species in southeastern Virginia.

If a rattlesnake is encountered outside of work areas, such as in their natural habitat or on roadways, they should be left alone. If a rattlesnake is found within training, military mission or cantonment areas where there is imminent danger to human safety, snakes should be captured and relocated. However, only trained personnel should attempt to capture and relocate rattlesnakes. Translocation is the practice of relocating individual "nuisance" rattlesnakes from areas where they are considered a threat to human safety to areas on the base where the possibility of human interactions is minimal or highly unlikely. Any manipulation of a venomous snake requires training and proper equipment to ensure safety for the manipulator and the snake. A contact list of people who are willing to assist and who have the appropriate training to capture and transport canebrake rattlesnakes has been developed by the natural resource manager.

Eastern Mud snake (*Farancia abacura*)

Photo Credit: Jeff Hall

There are no federally listed herpetofaunal species confirmed, or with the potential to be present on NSAHR NWA. As mentioned above, the only state-listed herpetofaunal species confirmed present on the installation is the canebrake rattlesnake. Virginia Species of Greatest Conservation Need (SGCN) that have been confirmed present on NSAHR NWA include the little grass frog (*Pseudacris ocularis*); greater siren (*Siren lacertian*); common ribbon snake (*Thamnophis sauritus sauritus*); eastern hog-nosed snake; eastern mud snake (*Farancia abacura abacura*); canebrake rattlesnake; northern scarlet snake (*Cemophora coccinea copei*) spotted turtle; snapping turtle; woodland box turtle and yellow-bellied slider (http://www.bewildvirginia.org/species/). Although not confirmed present, there is

the potential for other SGCN species occur: oak toad (*Anaxyrus quercicus*); carpenter frog (*Lithobates virgatipes*); eastern spadefoot (*Scaphiopus holbrookii*); eastern mud salamander (*Pseudotriton montanus montanus*); and the lesser siren (*Siren intermedia intermedia*).

Past and ongoing natural resource management/conservation actions that assist with protecting herpetofauna on NSAHR NWA include removal of invasive plant species and protection of wetlands. In addition, the collection/poaching of amphibians and reptiles is strictly prohibited on the installation. Furthermore, an educational pamphlet on the venomous snakes of NSAHR NWA has been developed and distributed to base residents. Future actions may include control of invasive animals, such as hogs, and control of feral cats. Specific projects that will help better understand amphibians and reptiles and the ecosystems and natural communities in which they occur include a targeted survey for Virginia SGCN species with the potential to occur; population estimate of the spotted turtles; and an installation-wide herpetofauna survey every five to seven years.

2.8.2.4 Invertebrates

No invertebrate surveys have been conducted at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. One study of invertebrates at NSAHR NWA includes the macroinvertebrate portion of a stream monitoring study of Mill Stream (Navy 2002c). This study showed the benthic macroinvertebrate population to be typical of those found in slow-moving Coastal Plain streams. Many of the organisms sampled are considered tolerant of pollution and other disturbances. The most common taxa were isopods, amphipods, snails, clams, midges, dragonflies, worms, and beetles. NHI and milkweed surveys at NSAHR NWA in 2018 did not identify any federally listed invertebrate species; however, three species listed in the state of Virginia were identified: reversed roadside skipper (*Amblyscirtes reversa)*, comet darner (*Anax longipes)*, and monarch butterfly (*Danaus plexippus plexippus)* (GMI AECOM 2019).

2.8.2.5 Mammals

There have been no mammal surveys performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Forty (40) species of mammals, representing 33 genera, have been documented during various faunal surveys conducted at NSAHR NWA (Appendix F, GMI AECOM 2019). The Installation lies within the current range of a number of other species that could occur at the Installation but have not been documented. Section 2.8.3.1 discusses rare, threatened, and endangered mammals observed at NSAHR NWA.

Large and medium-sized mammals that occur on NSAHR NWA include white-tailed deer (*Odocoileus virginianus*), American black bear (*Ursus americanus*), bobcat (*Felis rufus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), long-tailed weasel (*Mustela frenata*), nutria (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), North American beaver (*Castor canadensis*), and eastern cottontail (*Sylvilagus floridanus*). Beaver has been identified in Mill Stream on the NSAHR NWA, and the other large mammals are found throughout various habitats on the Installation, including habitats adjacent to urban areas. Nutria and muskrat spend most of their time in the extensive drainage ditch system in the Installation's agricultural land. Both species prefer open herbaceous vegetative cover areas and will rarely venture into a forested area. Recent additions to NSAHR NWA's species list are woodchuck (*Marmota monax*), northern river otter

(*Lontra canadensis*), and marsh rabbit (*Sylvilagus palustris*). Northern river otter is fairly common in the Northwest River area and is likely present in Mill Stream as well. The woodchuck is most frequently associated with open upland habitat and is known to occur in the agricultural and roadside areas of NSAHR NWA. The marsh rabbit's preferred habitat is coastal fresh and brackish marshes and is not likely to be very common at the Installation.

Common small mammals occurring at NSAHR NWA include gray squirrel (*Sciurus carolinensis*), southern flying squirrel (*Glaucomys volans*), hispid cotton rat (*Sigmodon hispidus*), white-footed mouse (*Peromyscus leucopus*), marsh rice rat (*Oryzomys palustris*), southern short-tailed shrew (*Blarina carolinensis*), least shrew (*Cryptotis parva*), southeastern shrew (*Sorex longirostris longirostris*), Dismal Swamp southeastern shrew (*S. l. fisheri*), meadow vole (*Microtus pennsylvanicus*), pine vole (*M. pinetorum*), eastern harvest mouse (*Reithrodontomys humulis*), southern bog lemming (*Synaptomys cooperi*), and house mouse (*Mus musculus*). The gray squirrel, southern flying squirrel, and white-footed mouse primarily are found in forested areas. The hispid cotton rat, eastern harvest mouse, and house mouse are most commonly found in upland old field or early successional habitats. The meadow vole and southern bog lemming may be found in marshy meadows, bogs, and occasionally in upland old field habitat. The marsh rice rat prefers open wetlands such as marshes and vegetated agricultural field ditches. The pine vole prefers woodland habitats with lots of herbaceous cover and leaf litter, but the vole can occasionally be found in old field habitats. Shrew species associated with NSAHR NWA are found in a wide variety of habitats, although they generally prefer areas that either have a thick cover of leaf litter or a dense layer of herbaceous vegetation. Other small mammals have been collected but are not as common as those listed above.

Surveys have documented several species of bats at NSAHR NWA. Seven bat species have been identified at NSAHR NWA to date including red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), evening bat (*Nycticeius humeralis*), southeastern myotis (*Myotis austroriparus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and northern long-eared bat (*Myotis septentrionalis*). Rafinesque's big-eared bat and northern long-eared bat were identified at the Installation during surveys conducted in 2013, 2016, and 2018 (Quillen 2013, Tetra Tech and Stell Environmental Enterprises 2015, Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b, Tetra Tech and Stell Environmental Enterprises 2019); these species are discussed in more detail in Section 2.8.3.1.

Mammals whose ranges extend into the NSAHR NWA area, but have not been recorded on the Installation, include striped skunk (*Mephitis mephitis*), and two species of moles, the eastern mole (*Scalopus aquaticus*) and the star-nosed mole (*Condylura cristata*). The striped skunk is very uncommon east of the Great Dismal Swamp; however, it is slowly expanding its range and could eventually be found on the Installation. The skunk is a species that occurs in upland habitats and would most likely be found in NSAHR NWA's upland hardwood forests. The eastern mole is usually associated with upland habitats and the star-nosed mole is more often associated with wetland habitats. Other bats that also may occur, but have not been documented on the Installation, include the hoary bat (*Lasiurus cinereus*), northern yellow bat (*L. intermedius*), Seminole bat (*L. seminolus*), Keen's myotis (*Myotis keeni*), little brown bat (*M. lucifugus*), and eastern pipistrelle (*Pipistrellus subflavus*).

2.8.3 Rare, Threatened, and Endangered Species

There have been no rare, threatened, and endangered species surveys performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA; however, table 2-8 provides species that are listed by the State of Virginia and their current status. There are no threatened or endangered species that can potentially occur within NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. USFWS Information for Planning and Consultation (IPaC) reports for NSAHR HQ, NSAHR LRA, and NSAHR PA can be found in Appendix F.

Rare plant and animal observations and identification of rare ecological communities have been documented only at NSAHR NWA during rare, threatened and endangered plant and animal surveys, and significant ecological community surveys completed at the Installation (Rose et al. 1988, Belden 1993, Schwab 2003a, Schwab 2003b, Quillen 2013, and Watts 2013, Tetra Tech and Stell Environmental Enterprises 2015, Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b, Tetra Tech and Stell Environmental Enterprises 2019, GMI AECOM 2019).

Surveys at NSAHR NWA in 2012, and more recently in 2018 targeted several rare plants (see Section 2.8.3.2 *Rare, Threatened, and Endangered Plants*) and wildlife (see Section 2.8.3.1 *Rare, Threatened, and Endangered Fish and Wildlife*). Based on the survey results and casual observations, two rare plants and 41 wildlife species have been identified at NSAHR NWA that are considered rare, threatened, or endangered under federal or state ESAs, or global or state conservation rankings. The status and rankings, and other conservation status information for rare, threatened, and endangered species that have been identified through surveys at NSAHR NWA are provided in Table 2-8. Species listed by the IPaC report can be found in Appendix F. No federally listed species are known to occur at NSAHR NWA; however, the northern long-eared bat is known to occur, and this species is listed as Threatened under the federal ESA.

Because the status of state and federal threatened and endangered species changes over time, careful tracking and periodic field surveys are needed to assess the status of rare species within all properties of NSAHR. NSAHR may also consider performing annual IPaC revisions (as part of annual Metrics) to stay updated on any changes to threatened and endangered listed species. The VDCR-DNH and NCDENR tracks the current status of natural heritage resources in a database that is available on its website.

The VDCR-DNH tracks the current status of natural heritage resources in a database that is available online at: http://www.dcr.virginia.gov/natural_heritage/infoservices.shtml#lists.

The NCDENR tracks the current status of natural heritage resources in a database that is available online at: http://portal.ncdenr.org/web/nhp/nhp-publications#rare-plant-and-animal-list.

Table 2-8. Virginia and North Carolina Rare Threatened and Endangered Species That Occur at NSAHR NWA.

Scientific Name	Common Name	Global Rank[1]	VA Rank[2]	NC Rank[2]	Federal Status[3]	VA Status[4]	NC Status[4]	Last Observed
Flora								
Chamaecyparis thyoides	Atlantic white cedar	G4	S3/WL	None	None	None	None	2018
Leucothoe fontanesiana	Highland doghobble	G5	S1/S2	None	None	None	None	1993
Listera australis	Southern twayblade	G4	None	S3/WL	None	None	W1	2018
Rhynchospora caduca	Anglestem beaksedge	G5	S1/S2	None	None	None	None	2018
Stewartia malacodendron	Silky camellia	G4	S3/WL	None	None	None	None	2018
Tillandsia usneoides	Spanish moss	G5	S1/S2	None	None	None	None	2018
Xyris fimbriata	Fringed yellow-eyed grass	G5	S1	None	None	None	None	2018
Fauna								
Class Amphibia								
Pseudacris ocularis	Little grass frog	G5	S3	None	None	None	None	2018
Class Aves								
Accipiter cooperii	Cooper's hawk	G5	S3B/S3N	None	None	None	None	2018
Accipiter striatus	Sharp-shinned hawk	G5	None	S1B/S4N	None	None	SR	Not available
Actitus macularius	Spotted sandpiper	G5	S1B1	None	None	None	None	Not available
Ammodramus savannarum	Grasshopper sparrow	G5	None	S3B/S1N	None	None	W1, W5	2002
Ardea alba	Great egret	G5	S2S3B/S3N	None	None	None	None	Not available

Table 2-8. Virginia and North Carolina Rare, Threatened and Endangered Species That Occur at NSAHR NWA, Cont.

Scientific Name	Common Name	Global Rank[1]	VA Rank[2]	NC Rank[2]	Federal Status[3]	VA Status[4]	NC Status[4]	Last Observed
Ardea herodias	Great blue heron	G5	S3B/S5N	None	None	None	None	2018
Botaurus lentiginosus	American bittern	G4	S1B/S2N	S1B/S2N	None	None	SR	2018
Setophaga virens waynei	Wayne's black-throated green warbler	G5T1	S1B?	S2B	None	None	E	2018
Circus hudsonius	Northern harrier	G5	S1S2B/ S3N	S1B/S4N	None	None	None	2018
Falco sparverius	American kestrel	G5	None	S2B/S5N	None	None	SR	2018
Helmitheros vermivorum	Worm-eating warbler	G5	None	S3B	None	None	W5	2018
Limnothlypis swainsonii	Swainson's warbler	G5	S2B	None	None	None	None	2018
Rallus elegans	King rail	G5	S2B/S3N	S3B/ S3N/WL	None	None	None	2018
Siren lacertina	Greater siren	G5	S3	S3	None	None	W3	Not available
Sitta canadensis	Red-breasted nuthatch	G5	S2B/S4N	S3B/S4N	None	None	W2, W5	Not available

Table 2-8. Virginia and North Carolina Rare, Threatened and Endangered Species That Occur at NSAHR NWA, Cont.

Scientific Name	Common Name	Global Rank[1]	VA Rank[2]	NC Rank[2]	Federal Status[3]	VA Status[4]	NC Status[4]	Last Observed
Sphyrapicus varius	Yellow-bellied sapsucker	G5	S1B/S4N	S2S3B/S5N	None	None	SR	Not available
Tringa solitaria	Solitary sandpiper	G5	None	None	None	None	None	Not available
Vermivora cyanoptera	Blue-winged warbler	G5	S3B	S2B	None	None	SR	Not available
Class Mammalia								
Corynorhinus rafinesquii	Rafinesque's big-eared bat	G3G4T3	S2	S3	None	E	SC	2015
Lasionycteris noctivagans	Silver-haired bat	G5	SUB/S4N	None	None	None	None	Not available
Lasiurus cinereus	Hoary bat	G3G4	None	S3S4	None	None	W2	2016
Lontra canadensis	Northern river otter	G5	S4	None	None	None	None	2002
Mustela frenata	Long-tailed weasel	G5	None	S3	None	None	W3	Not available
Myotis austroriparius	Southeastern myotis	G3G4	S2	S2	None	None	SC	2015
Myotis septentrionalis	Northern long-eared bat	G1G3	S1S3	S3	T	None	SR	2015

Table 2-8. Virginia and North Carolina Rare, Threatened and Endangered Species That Occur at NSAHR NWA, Cont.

Scientific Name	Common Name	Global Rank[1]	VA Rank[2]	NC Rank[2]	Federal Status[3]	VA Status[4]	NC Status[4]	Last Observed
Sorex longirostris fisheri	Dismal swamp southeastern shrew	G5T4	S3	None	None	T/PDL	None	2013
Sylvilagus palustris	Marsh rabbit	G5	S3	None	None	None	None	2018
Synaptomys cooperi helaletas	Dismal Swamp southern bog lemming		S3/WL					2018
Class Reptilia								
Clemmys guttata	Spotted turtle	G5	None	S4	None	None	W1	1998–1999
Crotalus horridus	Timber (canebrake) rattlesnake (Coastal Plain population)	G4	S1	S3	None	E	SC	2013
Lampropeltis triangulum elapsoides	Scarlet kingsnake	G5T5	S2S4	S3	None	None	W2	2013

[1] G1 = Critically Imperiled, G3 = Vulnerable, G4 = Apparently Secure, G5 = Secure, G_T_ = Signifies the rank of a subspecies (e.g., G5T1 would apply to a subspecies if the species is demonstrably secure globally [G5] but the subspecies warrants a rank of T1, critically imperiled), G_G_ = The rank is uncertain, but considered to be within the indicated range (e.g., G2G4) of ranks

[2] NC = North Carolina, VA = Virginia, S1 = Critically Imperiled, S2 = Imperiled, S3 = Vulnerable, S4 = Apparently Secure, S5 = Secure, S_N = Non Breeding Status, S_B = Breeding Status, U = Unknown, ? = Denotes inexact or uncertain numeric rank

[3] BCC = Bird of Conservation Concern, PE = Proposed for listing as Endangered, T = Threatened, SAT(T) = Similarity of Appearance (Threatened)

[4] NC = North Carolina, VA = Virginia, E = Endangered, PDL = Proposed for Delisting, SC = State Species of Concern, SR = Significantly Rare, T = Threatened, W1 = Species that are known to be declining in North Carolina, for one reason or another, W2 = Species that are rare to uncommon in North Carolina, but are not necessarily considered to be declining or otherwise in trouble, W3 = Species that are poorly known in North Carolina, but are not necessarily considered to be declining or otherwise in trouble, W5 = Species with increasing amounts of threats to its habitat, whether or not populations are known to be declining, WL = Watch list

* = IPaC listed species

Sources: GMI AECOM 2019, Roble 2016, NatureServe Explorer 2020, Tetra Tech and Stell Environmental Enterprises 2015 and 2019, Townsend 2020, USFWS 2020b

2.8.3.1 Rare, Threatened and Endangered Fish and Wildlife

No rare, threatened, and endangered fish and wildlife surveys have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. No species are listed in the IPaC reports for NSAHR HQ Complex, NSAHR LRA, or NSAHR PA (see Appendix F). Northern long-eared bat has been identified during surveys only at NSAHR NWA and is listed as Threatened under the federal ESA. Other species listed in the NSAHR NWA IPaC report can be found in Appendix F. In addition, three state listed species are known to occur, including two mammal species and one reptile species. These species are described in the following sections. In addition to species known to occur, NSAHR NWA could support other federal and state listed species, based on known species ranges and local habitats.

Birds

Rare bird species and bird species with special conservation status have been identified only at NSAHR NWA. Seven species that are significantly rare in North Carolina, one species that is a North Carolina species of concern, and nine bird species considered Birds of Conservation Concern by USFWS have been documented (Table 2-8). VDCR does not use the same designation to identify significantly rare species or species of concern; however, both states do use a ranking system to identify certain species and this information has been provided in Appendix F. Based on known ranges and habitats within NSAHR NWA, there is the potential for additional rare, threatened, or endangered bird species to occur on NSAHR NWA.

As part of the 1988 amendment to the Fish and Wildlife Conservation Act (Public Law 100-653), the USFWS is required to identify species, subspecies, and populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA (USFWS 2008). The USFWS published the most recent list of Birds of Conservation Concern (BCC) in 2008, which identified specific species within 37 Bird Conservation Regions across North America. The goal envisioned by the USFWS in identifying these BCC species is to stimulate the implementation of coordinated, proactive management and conservation actions among federal, state, tribal, and private partners to prevent these species from being listed under the ESA. Additionally, the Bird Conservation Region lists are intended to assist federal land-managing agencies and their partners in their efforts to abide by the bird conservation principles embodied in the MBTA and Executive Order (EO) 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds* (USFWS 2008). All properties within NSAHR are located within Bird Conservation Region 27, the Southeastern Coastal Plain.

No bird surveys have been conducted at NSAHR HQ Complex, NSAHR LRA or NSAHR PA. Table 2-9 lists species reported by IPaC that may potentially be observed at NSAHR HQ, NSAHR LRA and NSAHR PA and that are protected under the MBTA.

Table 2-9. Bird Species That May Occur at NSAHR HQ, NSAHR LRA and NSAHR PA.

Scientific Name	Common Name	Breeding Season
Haliaeetus leucocephalus	Bald eagle	Oct 15 to Aug 31
Rynchops niger	Black skimmer	May 20 to Sep 15
Dolichonyx oryzivorus	Bobolink	May 20 to Jul 31
Cardellina canadensis	Canada warbler	May 20 to Aug 10
Rallus crepitans	Clapper rail	10 to Oct 31
Calidris alpina arcticola	Dunlin	Breeds elsewhere
Sterna antillarum	Least tern	Apr 20 to Sep 10
Tringa flavipes	Lesser yellowlegs	Breeds elsewhere
Ammodramus nelsoni	Nelson's sparrow	May 15 to Sep 5
Dendroica discolor	Prairie warbler	May 1 to Jul 31
Protonotaria citrea	Prothonotary warbler	Apr 1 to Jul 31
Calidris maritima	Purple sandpiper	Breeds elsewhere
Melanerpes erythrocephalus	Red-headed woodpecker	May 10 to Sep 10
Gavia stellata	Red-throated loon	Breeds elsewhere
Arenaria interpres morinella	Ruddy turnstone	Breeds elsewhere
Euphagus carolinus	Rusty blackbird	Breeds elsewhere
Calidris pusilla	Semipalmated sandpiper	Breeds elsewhere
Numenius phaeopus	Whimbrel	Breeds elsewhere
Tringa semipalmata	Willet	Apr 20 to Aug 5
Hylocichla mustelina	Wood thrush	May 10 to Aug 31

Source: USFWS 2020b

Appendix F contains a list of birds that have been observed at NSAHR NWA, nine of which are USFWS Birds of Conservation Concern (BCC) species for Bird Conservation Region 27, including American kestrel, wood thrush, solitary sandpiper, red-headed woodpecker (*Melanerpes erythrocephalus*), prairie warbler (*Setophaga discolor*), prothonotary warbler, blue-winged warbler (*Vermivora cyanoptera*), Swainson's warbler (*Limnothlypis swainsonii*), Kentucky warbler (*Geothlypis formosa*), American bittern (*Botaurus lentiginosus*), and Swainson's warbler (*Limnothlypis swainsonii*). The federally listed red-cockaded woodpecker occurs in Currituck County, North Carolina, and Chesapeake County, Virginia. The closest known element occurrences are approximately 6.4 miles west of NSAHR NWA (John Hammond, personal communication). Red-cockaded woodpeckers nest and forage in a wide range of habitat types in Northeast NC/Southeast VA. Some of these, e.g., non-riverine swamp forest, may occur on the installation. In this part of their range, red-cockaded woodpeckers may use stand types that are not pine-dominated and that may contain only one or two pine trees ≥ 14 inches diameter at breast height (DBH) per acre. Generally, if these are managed for maintaining their natural ecological state(s), including whatever pine component they contain, these areas have potential to benefit the red-cockaded woodpecker. In addition, new surveys were completed in 2019 and a report was completed in 2020. As with state species of concern and watch list species, these birds are not protected under the ESA or state law; however, without additional conservation actions, they have

the potential to become candidates for listing. Also, in accordance with the MBTA, adverse impacts to these species and their habitats should be avoided or minimized to the greatest extent practicable when conducting Navy activities.

Fish

American Eel

American eel has been documented at NSAHR NWA within Mill Stream and Lunker Lake (Figure 2-12). American eel was petitioned for listing under the federal ESA in 2010, but in 2015 the USFWS found that protection was not warranted. The American eel, found in freshwater, estuarine, and marine habitats, has been extirpated from portions of its historical freshwater habitat during the last 100 years, primarily resulting from the construction of dams through the 1960s. Other threats are associated with habitat loss, overharvesting, degradation of current habitat, and mortality in hydropower plant turbines.

Herpetofauna

There have been no herpetofauna inventories performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. No federally listed herpetofauna species have been observed at NSAHR. Two state listed species, the timber (canebrake) rattlesnake Coastal Plain population and the little grass frog (*Pseudacris ocularis*) have been documented at NSAHR NWA. Four herpetofauna species that occur at NSAHR NWA have other state designated conservation status.

DoD Partners in Amphibian and Reptile Conservation (DoD PARC) Guidance for Updating and Enhancing Amphibian and Reptile Sections of Integrated Natural Resources Management Plans (DoD PARC 2019) recommends discussing all herpetofauna inventories and surveys, as well as including general discussions of the installation's herpetofauna species with the potential to occur, as well as discussions on rare, threatened, or endangered species found on the installation.

Greater Siren

The greater siren (*Siren lacertina*) is poorly known in North Carolina but is not known to be declining or otherwise in trouble (W3). The greater siren is an aquatic species with a stout body and gray or olive coloring with dark spots on the head, back, and sides. Greater sirens are commonly found in ditches, lakes, ponds, and other slow-moving fresh waters. The species is nocturnal, spending most of the day hidden under debris or rocks. Greater sirens occur from southern Maryland in the coastal plain south through peninsular Florida and west to southern Alabama (NatureServe Explorer 2020).

Little Grass Frog

The little grass frog is considered vulnerable in Virginia (S3). The species is very small with a coloration that is variable from tan, brown, greenish, pink, to reddish, with a dark line passing through the eye and onto the side of the body. This frog is found in southeastern Virginia, generally in moist grassy areas near ponds, bogs, pools or streams in hardwood forests and wooded swamps (NatureServe Explorer 2020). Four little grass frogs were observed during recent Natural Heritage Inventory and milkweed surveys in 2018 (GMI AECOM 2019).

Spotted Turtle

The spotted turtle (*Clemmys guttata*) is a small semi-aquatic turtle that is considered a species of Collection Concern in the Hampton Roads Planning Region of Virginia and vulnerable in North Carolina (S3) and is a species known to be declining (W1). The upper shell is black and usually covered with scattered rounded yellow spots with gray to black limbs. Mating occurs March–May, typically during cooler weather. Hatching occurs in late August–September. Spotted turtles inhabit mostly unpolluted, shallow bodies of water with a soft bottom and aquatic vegetation, such as small marshes, marshy pastures, bogs, fens, woodland streams, swamps, small ponds, vernal pools, and lake margins. Spotted turtle activity is strongly diurnal. Spotted turtles can often be seen basking along the water's edge, on brush piles in water, or on logs or vegetation clumps. Cold season hibernation occurs in the muddy bottoms of waterways or bogs in communal hibernacula (NatureServe Explorer 2020).

Scarlet Kingsnake

The scarlet kingsnake (*Lampropeltis triangulum elapsoides*) is considered imperiled/apparently secure in Virginia (S2S4) and is considered vulnerable in North Carolina (S3). Scarlet kingsnakes are red, black and yellow in coloring, and grow up to two feet long in length. Scarlet kingsnakes inhabit pine flatwoods, wet prairie hammocks but can be found less frequently in bottomland, mixed hardwood, and upland pine forests. Scarlet kingsnakes can also be found in coastal plains and forested wetlands. The species is very secretive (NatureServe Explorer 2020).

Timber (Canebrake) Rattlesnake Coastal Plain Population

The timber (canebrake) rattlesnake Coastal Plain population is a Virginia endangered species (Roble 2016) and a North Carolina species of special concern (Ratcliffe 2018). The VDWR recognizes the Coastal Plain (canebrake) population as a unique geographic variation of the timber rattlesnake. The objective of the 2011 Canebrake Rattlesnake Conservation Plan is downlisting the species to threatened status, with a complete delisting of the species being unlikely due to lack of suitable habitat (VDGIF 2011). The plan also considers having protected populations in the Great Dismal Swamp and NSA NWA as key conservation criteria. The timber (canebrake) rattlesnake is large-bodied, (up to 67 in [170 cm]), brownish gray or pinkish snake, with distinctive brown or chestnut middorsal stripe, black blotches and chevrons, and a distinctive yellowish eye-jaw stripe (Mitchell 1994). In support of conserving and managing the timber (canebrake) rattlesnake population on NSAHR NWA, the NRP does not authorize small game hunting of squirrels, as they are a primary diet source of these snakes on the installation.

Timber (Canebrake) Rattlesnake (*Crotalus horridus* [Coastal Plain population])

Photo credit: Navy 2006b

Two studies of the timber (canebrake) rattlesnake Coastal Plain population at NSAHR NWA used radiotelemetry monitoring on more than 35 snakes to document their movements, habitat use, thermal relations, and behavior (Savitzky and Petersen 2001 and Savitzky and Petersen 2004). Results of these

studies show that there is great variation in the movements of individual snakes, with male movements averaging approximately 5.0 mi (8.0 km) per year, and female movements averaging approximately 2.7 mi (4.3 km) per year. Analysis of habitat use revealed that these rattlesnakes were located most frequently in deciduous forest habitats (77% of observations) of NSAHR NWA, with only 13% of observations occurring in pine forests, and 8% of observations occurring in early successional habitat. The use of pine forest and agricultural habitats occurred far less frequently than expected based on habitat availability, whereas use of deciduous forest habitat was proportionately more frequent. Rattlesnakes were infrequently observed in the northwest region of NSAHR NWA, which was in agricultural production prior to the 1960s, and is now dominated by relatively young pine forest. The timber (canebrake) rattlesnake studies documented certain other behaviors that were more frequently associated with specific habitats. Shedding occurred frequently in clear-cuts, ambushing and feeding occurred overwhelmingly in deciduous forest, and courtship occurred relatively often in both clear-cuts and agricultural fields (Savitzky and Petersen 2001 and Savitzky and Petersen 2004). Hibernation sites were located exclusively in deciduous forest.

Mammals

Northern Long-eared Bat

Northern long-eared bat (*Myotis septentrionalis*)

Photo credit: L. E. Quillen

The USFWS initiated a 90-day review on 29 July 2011 to determine if federal listing of northern long-eared bat was warranted. On 02 October 2013, USFWS published their proposal to list the northern long-eared bat as endangered throughout its range under the ESA (78 FR 191). On 06 January 2014, the USFWS published their Interim Conference and Planning Guidance that addresses immediate information needs for Section 7 consultations and conservation planning for this species, should it be officially listed as endangered (USFWS 2014). Due to declines caused by white-nose syndrome and continued spread of the disease, the northern long-eared bat was listed as threatened under the ESA on April 2, 2015. The USFWS also developed a final 4(d) rule, which published in the Federal Register on January 14, 2016 and specifically defined the "take" prohibitions. On 27 April 2016, the USFWS published their determination of critical habitat for the species and determined that it was not prudent.

Northern long-eared bat was identified at NSAHR NWA during bat acoustic and mist netting surveys conducted in 2013, 2016, and in 2018 (Quillen 2013, Tetra Tech and Stell Environmental Enterprises 2015, Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b, Tetra Tech and Stell Environmental Enterprises 2019). Bat baseline surveys and northern long-eared bat surveys were conducted in 2015 and twice in 2016; Rafinesque's big-eared bat was detected in all surveys. Nine female northern long-eared bats were detected during northern long-eared bat surveys (Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b). Additional northern long-eared bat surveys in 2018 captured five female and three male northern long-eared bats during mist-net surveys (Tetra Tech and Stell Environmental Enterprises 2019).

Preferred summer roosts of the northern long-eared bat are generally associated with old-growth forests composed of trees 100 years old or older, and this species is dependent on intact interior forest habitats that have a low edge-to-interior ratio (76 Federal Register [FR] 38095-38106). Relevant late-successional forest features include a high percentage of old trees, uneven forest structure, single and multiple tree-fall gaps, standing snags, and woody debris. This species appears to favor small cracks or crevices in cave ceilings for hibernation. Northern long-eared bats are opportunistic insectivores, obtaining prey both in flight and by gleaning from surfaces. Prey includes small insects, such as moths, flies, leafhoppers, and beetles. Forested hillsides and ridges are their preferred foraging habitat, with the presence of mature forest stands thought to play an important role in their foraging behavior. Foraging occurs at dusk over small ponds and forest clearings under the forest canopy, or along streams.

Rafinesque's Big-eared Bat

Rafinesque's big-eared bat was identified at NSAHR NWA during bat acoustic and mist netting surveys conducted in 2013, 2016, and in 2018 (Quillen 2013, Tetra Tech and Stell Environmental Enterprises 2015, Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b, Tetra Tech and Stell Environmental Enterprises 2019). Rafinesque's big-eared bat is a Virginia endangered species and North Carolina species of special concern. The 2013 surveys identified seven individual Rafinesque's big-eared bats at six locations (Figure 2-16), two of which were lactating females, which suggests that there is a maternity colony close by. Bat baseline surveys and northern long-eared bat surveys were conducted in 2016 and Rafinesque's big-eared bat was detected during both surveys. Additional northern long-eared bat surveys in 2018 detected Rafinesque's big-eared bat during acoustic and mist-net surveys and captured five female and three male northern long-eared bats during mist-net surveys (Tetra Tech and Stell Environmental Enterprises 2019).

Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)

Photo credit: L. E. Quillen

USFWS' Northern Long-eared Bat Interim Conference and Planning Guidance (06 January 2014) is available online:

https://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf

Silver Haired Bat

Silver-haired bat has also been identified at NSAHR NWA and is included on the Virginia state animals watch list (Roble 2016). Breeding status of silver-haired bat in Virginia is unknown, but the non-breeding status of this species in Virginia is apparently secure. Habitat for other bat species that have the potential to occur is present at NSAHR NWA. Due to significant declines in bat populations throughout the eastern U.S. these bat species have the potential to become listed during the plan period for this INRMP.

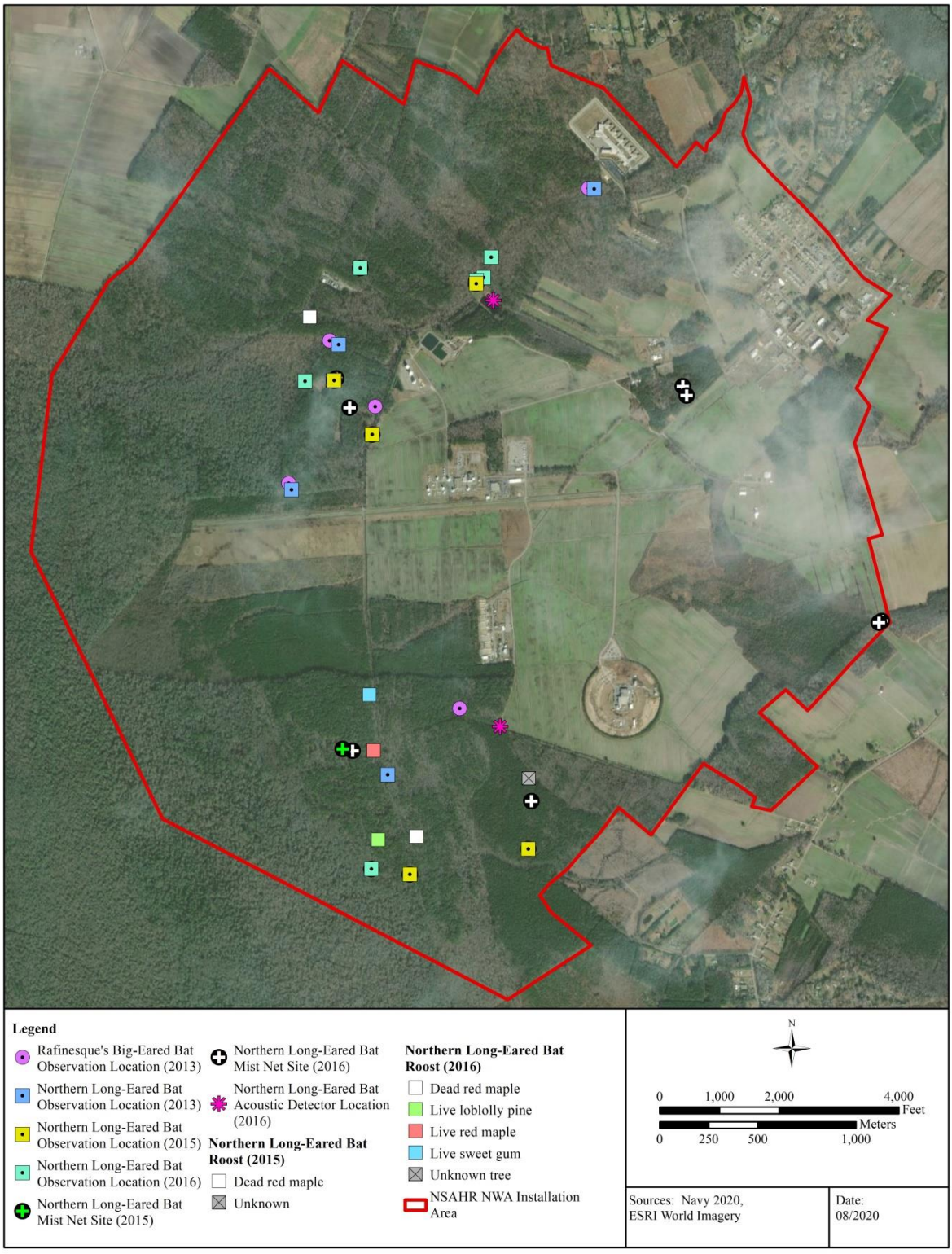

Figure 2-16. Rafinesque's Big-eared Bat and Northern Long-eared Bat Observation, Mist-Net, and Detector Locations at NSAHR NWA.

Populations of several bat species with ranges along the eastern U.S. have succumb to significant declines in recent years due to white-nose syndrome, a fungus that can infect hibernacula and significantly impact overwintering populations. White-nose syndrome has spread from the northeastern to the central U.S. at an alarming rate, and since the winter of 2007–2008, millions of insect-eating bats in 22 states and five Canadian provinces have died from this devastating disease (USGS National Wildlife Health Center 2020). The disease is named for the white fungus, *Geomyces destructans*, which infects skin of the muzzle, ears, and wings of hibernating bats. As a result, the USFWS has initiated reviews of several bat species to determine if population declines and threats from white-nose syndrome warrant ESA listing.

Dismal Swamp Southeastern Shrew

Dismal Swamp Southeastern Shrew (*Sorex longirostris fisheri*)

Photo credit: Navy 2006b

The Dismal Swamp southeastern shrew was documented during rare, threatened, and endangered species surveys conducted at NSAHR NWA in 2013. The Dismal Swamp southeastern shrew is a subspecies of the southeastern shrew, known only to occur within the vicinity of the Dismal Swamp. The Dismal Swamp southeastern shrew is similar to the southeastern shrew but is 20–25% larger (65 FR 10420-10426). Both species are small, long-tailed mammals with a brown back, slightly paler under parts, buffy feet, and relatively short, broad noses. Studies conducted at Great Dismal Swamp in 1980 and at NSAHR NWA in 1988 (Rose et al. 1988) provide information on the occurrence and habitat preferences of this subspecies, with supplemental occurrence and habitat information collected for this species in 2013. The Dismal Swamp southeastern shrew was most abundant in mid-successional forests that have fairly open canopies, heavy woody and herbaceous components, a moderate litter layer, and diverse vertical structure. Organic soils were another important habitat factor. The Dismal Swamp southeastern shrew was found to be active day and night, feeding in underground tunnels or under leaf litter. In comparison to occurrence and habitat preferences associated with the southeastern shrew, the Dismal Swamp southeastern shrew is more frequently associated with dryer upland sites.

At the time the Dismal Swamp southeastern shrew surveys were initially conducted (Belden 1993 and Rose et al. 1988), it was listed as a federal threatened species. Dismal Swamp southeastern shrew was removed from the federal ESA (delisted) in February 2000 (65 Federal Register (FR) 10420-10426); however, this species is still listed as threatened in Virginia (Roble 2016). Previous consultation with the USFWS (1992) identified specific areas on NSAHR NWA as non-Dismal Swamp southeastern shrew habitat (Figure 2-17). Documentation of Dismal Swamp southeastern shrew during the rare, threatened, and endangered species surveys conducted at NSAHR NWA in 2013 was within habitats identified as non-Dismal Swamp southeastern shrew habitat identified by USFWS (Figure 2-17) (Quillen 2013). Flora associated with the 2013 species observations include areas dominated by giant cane, or areas of early successional habitat that were dominated by sweetgum, red maple, oaks, and others plant species.

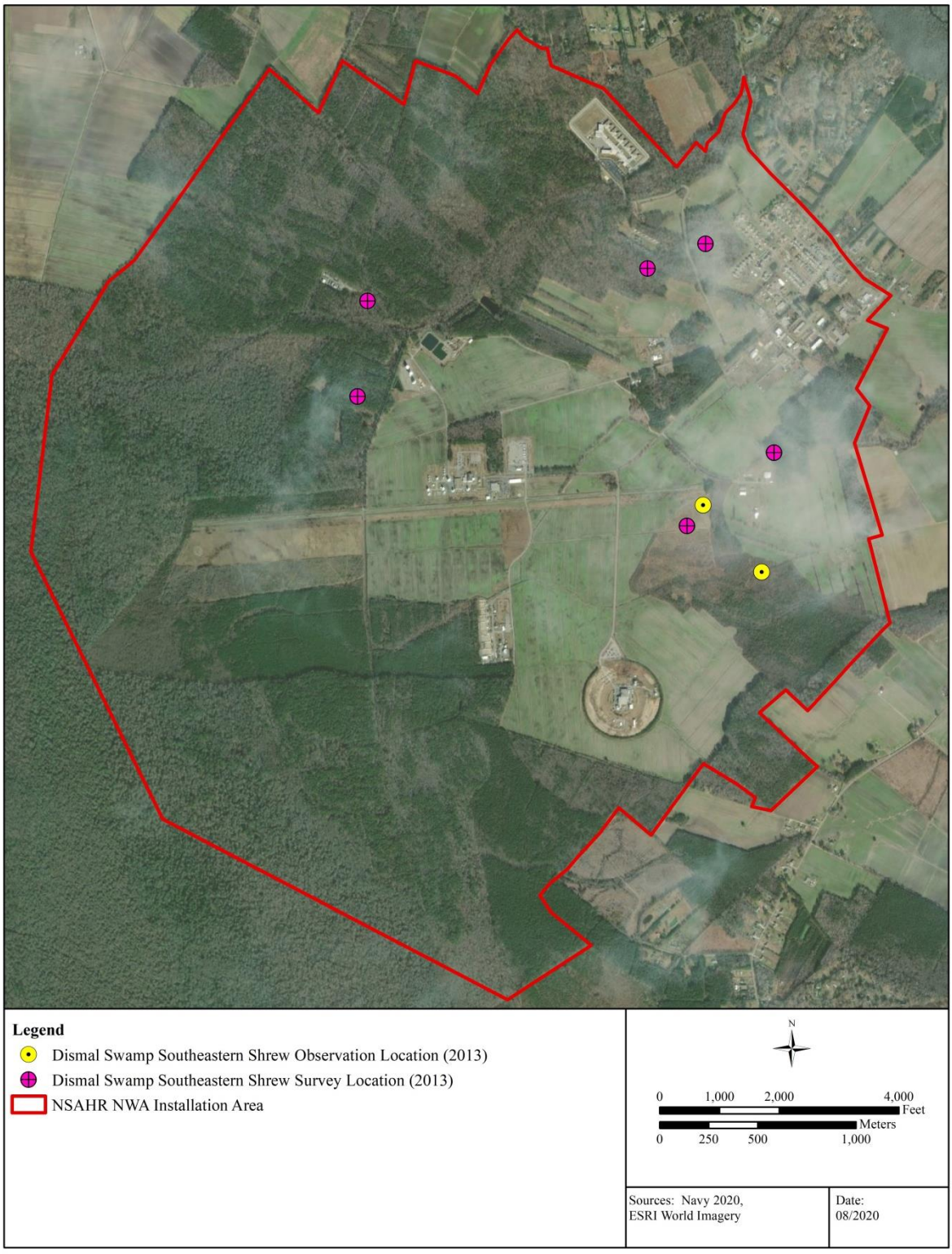

Figure 2-17. USFWS Designated Non-Dismal Swamp Southeastern Shrew Habitat and Survey Locations of NSAHR NWA.

Three different Biological Opinions (BOs) were conducted for the Dismal Swamp southeastern shrew while the species was listed as federally threatened. The first BO addressed the impacts to the species due to construction of a 22,400 square foot Bachelor's Enlisted Quarter in support of increase personnel loading requirements for the ROTHR antenna. The 1989 BO concluded that impacts to the species from the Proposed Action would be minimal due to lack of suitable habitat and vegetation structure limits. The second BO addressed the impacts to Dismal Swamp southeastern shrew due to vegetation clearing and burning of approximately 123 ac (49.8 ha) to maintain the clear zone of the ROTHR antenna. The BO concluded that the Proposed Action would not likely jeopardize the continued existence of the species. The third BO addressed impacts to the species from the clearing of vegetation at approximately 48 ac (19 ha) within the area of an existing Circular Disposed Antenna Array (CDAA), located at the Naval Security Group Activity Northwest. The BO concluded that the Dismal Swamp southeastern shrew would not likely be jeopardized by the Proposed Action.

Other Mammals

Three mammal species identified at NSAHR NWA have special state rankings or state status, including marsh rabbit, northern river otter, and long-tailed weasel. Marsh rabbit is considered vulnerable in Virginia (S3), northern river otter is considered apparently secure in Virginia, and long-tailed weasel is considered vulnerable/apparently secure in North Carolina and has a watch status of W3 in North Carolina. North Carolina watch status W3 is designated for those species that are poorly known in North Carolina but are not necessarily considered to be declining or otherwise in trouble (Ratcliffe 2018). The distribution and population sizes of such species are not well known, which is especially true for a large number of invertebrates, as well as secretive or nocturnal vertebrates. These species were detected again in 2019 at NSAHR NWA during Natural Heritage Inventory and milkweed surveys (GMI AECOM 2019).

2.8.3.2 Rare, Threatened, and Endangered Plants

No federally listed plant species have been identified at any properties of NSAHR, and no rare, threatened, and endangered plant surveys have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA.

Three plants listed as rare (S1/S2) in Virginia have been observed at NSAHR NWA (Wright 2013a and Belden 1993, GMI AECOM 2019): anglestem beaksedge (*Rhynchospora caduca*), highland doghobble (*Leucothoe fontanesiana*), and Spanish moss (*Tillandsia usneoides*).

Southern twayblade (*Listera australis*) has been documented at NSAHR NWA, and at the time it was discovered in 1992 it was considered rare (Belden 1993). At the time of discovery, the Great Dismal Swamp Natural Heritage Resource Area was established at the Installation, along the western boundary and in association with the Great Dismal Swamp habitat located at NSAHR NWA (Figure 2-12). This plant species is no longer tracked by the VDCR-DNH; however, the species is ranked as vulnerable by NCDENR (Gadd 2018). Species of concern and watch list species are not protected under state or federal ESAs.

Protection of these species and their habitats, however, is warranted in order to prevent their further decline and eventual regulation under the ESA.

3.0 ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

3.1 Supporting Sustainability of the Military Mission and Natural Environment

3.1.1 Integrating Military Mission and Sustainable Use

The DOD's land management responsibilities include acting as a steward for hundreds of the nation's rarest species and most characteristic habitats without compromising the preparedness of the Armed Forces (Stein et al. 2008). To this end, the Navy takes a proactive approach toward integrating the military mission with concepts of sustainable land use. Efficient and effective land use planning and natural resources management supports military readiness and sustainability while also protecting and enhancing natural resources. Using natural resources in a sustainable way that preserves ecosystem integrity is vital to ensuring that military mission activities can continue to be conducted on these lands over the long term.

The Navy understands the role INRMPs play in identifying potential conflicts between an installation's mission and natural resources and identifying actions necessary to maintain the availability of mission-essential properties and acreage. An INRMP outlines goals and objectives for use by the installation NRM in order to balance the management of natural resources unique to an installation with military mission requirements and other land use activities affecting those resources (DOD and USFWS 2002). The NSAHR NRM is responsible for ensuring the accomplishment of the military mission in a way that sustains and enhances the natural resources on the installation (Stein 2008). The NRM accomplishes this requirement by using an ecosystem management approach for the stewardship of the natural resources, and by working in close cooperation with military operators to ensure mutual support and understanding.

The available natural resources at NSAHR provide practical ecosystem services. These natural resources include wetlands, vegetation buffers, sensitive habitats, and other habitats that provide critical ecosystem services. Key ecosystem services of these natural resources are stormwater management, pollutant removal, and storm-surge buffering. NSAHR's natural resources also provide opportunities for outdoor recreation and aesthetic benefits; this contributes to the installation's MWR Program, which aims to enhance the quality of life for military personnel, their family members, and civilian personnel. The nature of military mission activities at NSAHR have the potential to affect natural resources, specifically within the ROTHR clear zone and the small arms training and operational facilities located in the Forest Conservation Management Unit at NSAHR NWA. NSAHR NWA is located in a rural area and has strived to conserve habitats that support special status species and other areas with natural resources value located throughout the installation.

3.1.2 Impact on Military Mission

To protect and maintain natural resources while ensuring the continuation of the military mission, many Navy installations have implemented an ecosystem management approach for environmental stewardship of the installation's natural resources. The management strategy

maximizes the use of suitable lands for the military mission while minimizing impacts on natural resources.

The types of natural resources constraints that may affect NSAHR's mission are different from those of installations with combat training missions. Military missions at NSAHR include supporting tenant commands, their personnel, and dependents through a number of storefront activities. Currently, natural resources management at NSAHR does not significantly affect military mission. As is discussed under Section 5.2, NSAHR is achieving no net loss in the capability of military lands to support the mission of all installations within NSAHR through the implementation of the INRMP.

3.1.3 Relationship to Other Operational Management Plans

This INRMP is not intended to replace existing installation policy, operations protocols, or military management plans. Rather, this INRMP is meant to facilitate the integration and coordination of natural resources management actions with other plans and programs at the installation and, moreover, with NSAHR missions.

The preparation and development of an INRMP must be coordinated with the development of other installation plans, planning processes, and NEPA documents as required by DoD guidance (Navy 2006a). Examples of some of these plans include installation range plans, training plans, integrated cultural resource and pest management plans, and installation restoration plans. Existing plans or programs that will be implemented in coordination with this INRMP include, but are not limited to:

- NSAHR NWA Wildfire Management Plan (2017; most recent plan in review);
- NSAHR PA and NSAHR NWA Integrated Pest Management Plan (2013, 2017)
- NSAHR HQ Complex and NSAHR NWA Oil Spill Prevention, Control, and Countermeasures Plan (SPCCP) (2017, 2001);
- NSAHR NWA Forest Management Plan (2019);
- NSAHR NWA Urban Forestry Management Plan (2017);
- NSAHR NWA Soil Water Conservation Plans (2019);
- NSAHR Stormwater Pollution Prevention Plan (2019)
- Hazardous Materials Reutilization, Hazardous Waste Minimization, and Disposal Guide (2019);
- Recreational and Migratory Fisheries Assessment and Enhancement for Lunker Lake and Mill Stream at Naval Support Activity Hampton Roads Northwest Annex (2014);
- NSAHR ICRMP (2019); and
- Small Arms Range & Explosive Range Development Plans (Draft).

NSAHR does not have any range complex management plans or other operation plans in place that would need to be coordinated with implementation of this INRMP. Planning for training activities, other military mission requirements, MWR, natural resources, and other activities are

coordinated through each of the NAVFAC PWD divisions and NAVFAC Mid-Atlantic regional personnel as appropriate. The PWD's Environmental Division provides a NRM to obtain support from the NSAHR PWD's installation, and to review activities for natural resources concerns, recommendations, and environmental medias within the PWD with reach back support to NAVFAC Mid-Atlantic regional media managers. This ensures that the military mission is not compromised and that the Installation is meeting the mandated environmental regulatory requirements. Environmental resources must be considered during the planning and development of future training areas and facilities at NSAHR, including infrastructure stabilization/repair, new construction, increases in type and levels of training in existing training/testing/evaluation areas, etc. These reviews are typically conducted via three different reviewing processes: the Environmental Checklist (Appendix B) review process submitted during the site approval process; the Work Permit review process submitted by a tenant command requesting to conduct in-house work; and the Site Work Induction Board review process where work requests have been submitted that require PWD assistance.

3.2 Climate Change

There are consistent and widespread long-term warming climate trends throughout the planet. Average annual temperature has increased by approximately 1.8°F globally since the beginning of the 20th century, and by 1.2°F over the contiguous U.S. (U.S. Global Climate Research Program [USGCRP] 2018). DoD Manual 4715.03 requires the Navy to consider climate change in the development of INRMPs to help mitigate impacts on military installations. Impacts that must be considered include shifts in species' ranges and distributions, changes in phenology, rising sea levels, and variations in ecological processes such as drought, fire, and flood (DoD 2019a).

The USGCRP released its *Fourth National Climate Assessment* in 2018, which was written under the authority of the Federal Advisory Committee Act and mandated by the Global Change Research Act of 1990. The report identified several trends and projected impacts related to climate change throughout the U.S. as well as within specific regions of the country. The annual average temperature in the southeastern U.S. has risen 2.0°F (1.1°C) since 1970 with the greatest seasonal increase in the winter months. There has been a 30% increase in fall precipitation over most the region and summer precipitation has decreased over almost the entire region. Additionally, the power of Atlantic hurricanes has increased since 1970, associated with an increase in sea surface temperature. Climate models project increases in temperature and extreme precipitation for all scenarios (USGCRP 2018).

The continued impacts of these projected increases include more heat-related illness, declines in forest growth and agricultural crop production, declines in cattle production, increased buckling of pavements and railways, and reduced oxygen levels in streams and lakes causing fish kills and declines in aquatic species diversity. The report indicates that without significant adaptation measures, sea-level rise and increases in hurricane intensity will be among the most serious consequences of climate change, especially for low-lying areas along the Atlantic coast (USGCRP 2018).

The DoD's Strategic Environmental Research and Development Program (SERDP) is conducting several studies that address DoD coastal installations' information and decision needs under the threat of climate change. Project RC-1701, *Risk Quantification for Sustaining Coastal Military*

Installation Assets and Mission Capabilities, is a funded initiative that provides a risk assessment framework that will be suitable for assessing changes in risks to coastal military installation assets and missions in the Hampton Roads region due to global climate change effects. The study focuses on the Norfolk Naval Supply Station; however, the assessment framework will help policymakers and NRMs develop strategies that support mission adaptation and long-term sustainability at DoD installations throughout the region (SERDP 2017). The project produced a robust, scientifically informed risk-based approach for coastal military installations threatened by coastal hazards and rising sea levels. Using Bayesian networking, a series of stepwise processes were established to combine various coastal storm models with installation-specific asset models and regional ecosystem response models, to thoroughly assess risks to a mission in a probabilistic method (SERDP 2017).

The Federal Flood Risk Management Standard established by Executive Order (EO) 11988 requires federal agencies to utilize construction standards for projected climate change scenarios that are stricter. NAVFAC Mid-Atlantic uses current hydrologic and hydraulic scientific data to develop future flooding to address EO 11988. The Unified Facilities Criteria (UFC) 2-100-01 directs Master Development Planners to consider climate change in the development of Master Plans and projects including the Installation Master Planning, and other DoD guidance. The 2017 Climate Change Installation Adaptation and Resilience Planning Handbook (Leidos and Berger, 2017), in accordance with UFC, provides a framework to help planners understand how to consider climate change in their plans and projects, and is used during the analysis phase of the Navy Installation Development Plan (IDP) process.

Virginia implemented a three-phase Climate Change Adaptation project, funded through the Virginia Coastal Zone Management Program (VCZMP) under a Coastal Zone Management grant administered by NOAA, to identify climate change impacts and the region's vulnerabilities, as well as potential strategies to adapt to these impacts. Phase I of the project was the *Climate Change in Hampton Roads: Impacts and Stakeholder Involvement* report (HRPDC 2010), which assessed vulnerability and summarized the climate science of the Hampton Roads region. The report concluded that the greatest climate threats to the region were the combined effects of sea-level rise and storm surges. Roadways and railways throughout the region were at risk of flooding or structural damage from storm surges and sea-level rise. Phase II of the project was the *Climate Change in Hampton Roads: Storm Surge Vulnerability and Public Outreach* report (Hampton Roads Planning District Commission [HRPDC] 2011), which confirmed that sea-level rise and storm surges were the most impactful threats and provided exposure maps of vulnerable populations and infrastructure through a GIS tool. The report also included recommendations for improving research and considerations for planning for sea-level rise. For Phase III, the *Climate Change in Hampton Roads: Sea Level Rise in Hampton Roads, Virginia* report (HRPDC 2012), the GIS tool developed in Phase II was modified to analyze impacts of sea-level rise and aid local decision makers in developing cost-efficient adaptation strategies. The report included an analysis of the difficulties experienced in compiling various data sets and estimated that the region could face up to 5.7 feet of sea-level rise under a high emissions scenario that factors in ice sheet melt and regional subsidence. An analysis of a 1-meter rise in sea level resulted in much of the region's transportation infrastructure being vulnerable to flooding, including 18 miles of interstate highways, 77 miles of state primary roads, 100 miles of secondary roads, and 683 miles of local and private roads.

Since completing the three-phase study, HRPDC has continued to develop tools and provide other planning support for local governments. HRPDC completed the Coastal Resiliency: *Adapting to Climate Change in Hampton Roads* report in 2013 (HRPDC 2013), which identified natural opportunities for local governments to include sea-level rise into their planning processes and policies. The Hampton Roads Sea-Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project took place between 2015 and 2016 and combined federal, state, and local agency efforts with private industry and researchers to take a more comprehensive approach to preparedness and resilience to sea-level rise (Steinhilber et al. 2016).

3.2.1 Future Climate Change Trends

The state of Virginia has been experiencing hotter summers in recent decades, a trend that is projected to continue in the future. Decreases in air quality, worsening seasonal pollen allergies, increased mosquito and tick-borne infections, coastal flooding, and sea-level rise are also projected to continue (NRDC 2018). The Hampton Roads region of Virginia is especially susceptible to coastal flooding because it is low-lying and experiencing subsidence (EPA 2016, NRDC 2018); the Sewells Point tide gauge in Norfolk has experienced an equivalent of 18.2 inches in sea-level rise in the last 100 years. Under an extreme scenario, water levels adjacent to NSAHR HQ Complex, NSAHR LRA, and NSAHR PA are expected to increase by 2-10 ft (0.6-3 m) by 2100 (Figures 3-1, 3-2, and 3-3).

3.2.2 Implications for Natural Resources Management

Sea-level rise and increased storm surges may be significant issues for sustaining habitat for migratory birds and terrestrial, river, and marine wildlife at NSAHR. Warming temperatures may result in the expansion of invasive species, likely causing invasive species management to be a continuing problem at NSAHR.

Adaptation strategies for NSAHR can focus on promoting climate change resiliency to enable natural resources sustainability. Adaptation strategies can include the following types, as examples:

Decrease Stressors – Decrease other stressors that negatively affect at-risk species, priority habitats, such as the stressors of invasive species, disease vectors, polluted runoff, and future development of remaining natural areas and open space.

Sustain Coastal Habitats – To minimize loss of coastal beaches and marshes, conserve adjacent upland areas to allow coastal lands to naturally migrate inland as the sea rises. Additionally, beach replenishment with sediment, although costly, may be an option.

Restore Habitat – Continue to restore priority habitats and ecosystems including habitat for at-risk species. Undertake restoration, creation, and enhancement of wetlands and other natural habitats that are most threatened by climate change. Restore riparian forest habitats to decrease sediment and nutrient loads into the Elizabeth River and thus the Chesapeake Bay.

Education and Outreach – Educate NSAHR personnel and surrounding communities on the threat climate change poses to natural resources and resulting impacts on property, structures, and infrastructure.

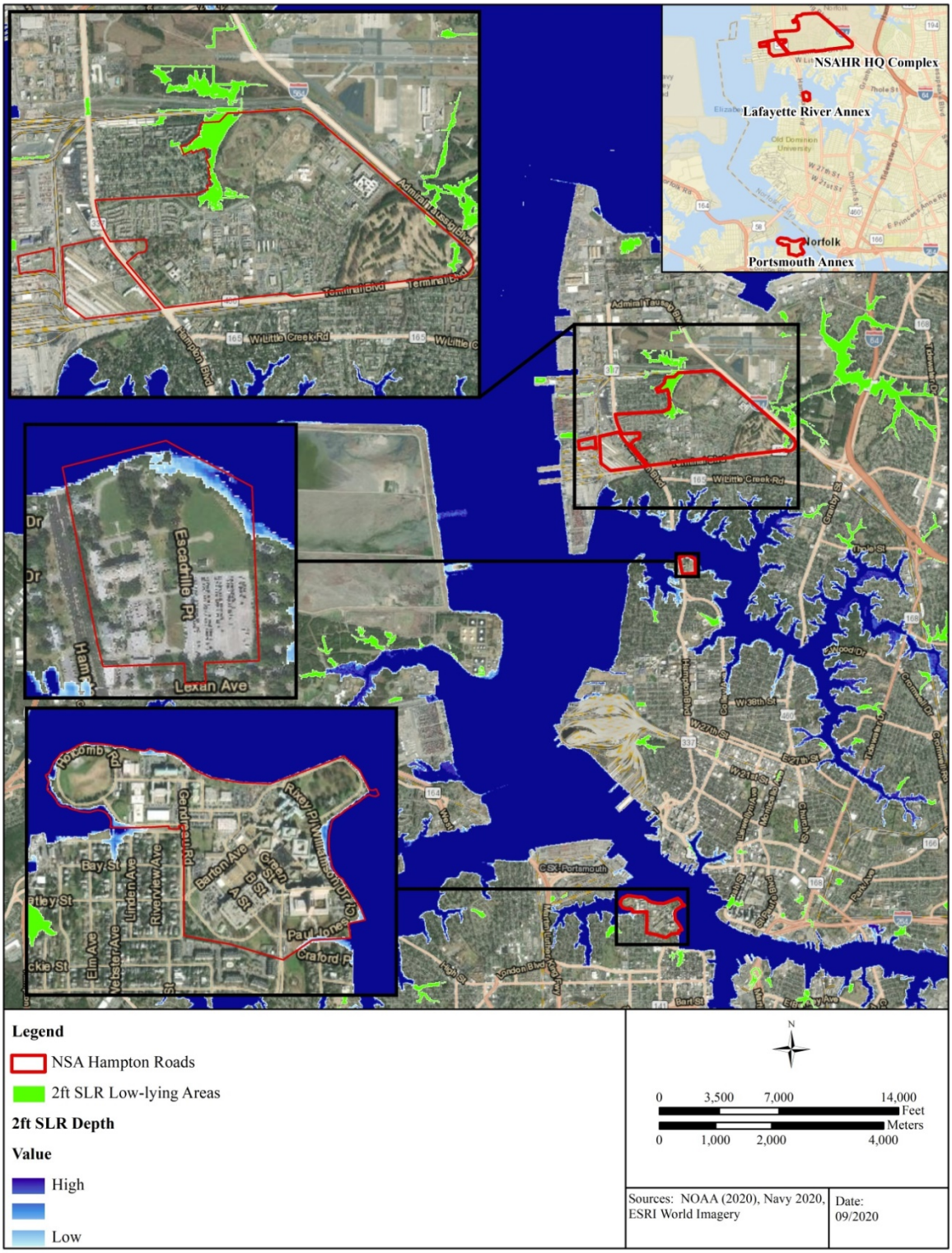

Figure 3-1. Two feet SLR Scenario for NSAHR HQ Complex, NSAHR LRA, and HSAHR PA.

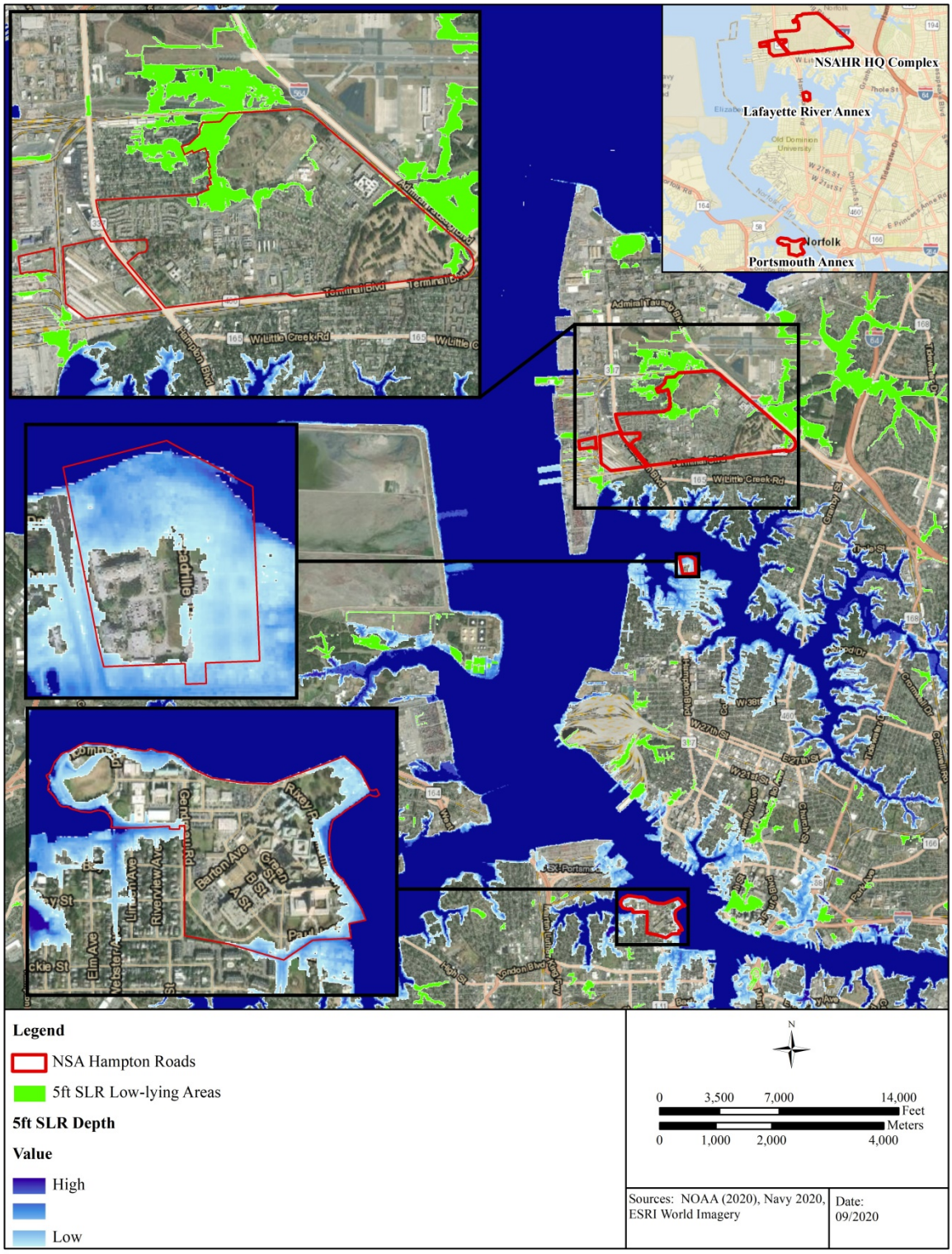

Figure 3-2. Five feet SLR Scenario for NSAHR HQ Complex, NSAHR LRA, and HSAHR PA.

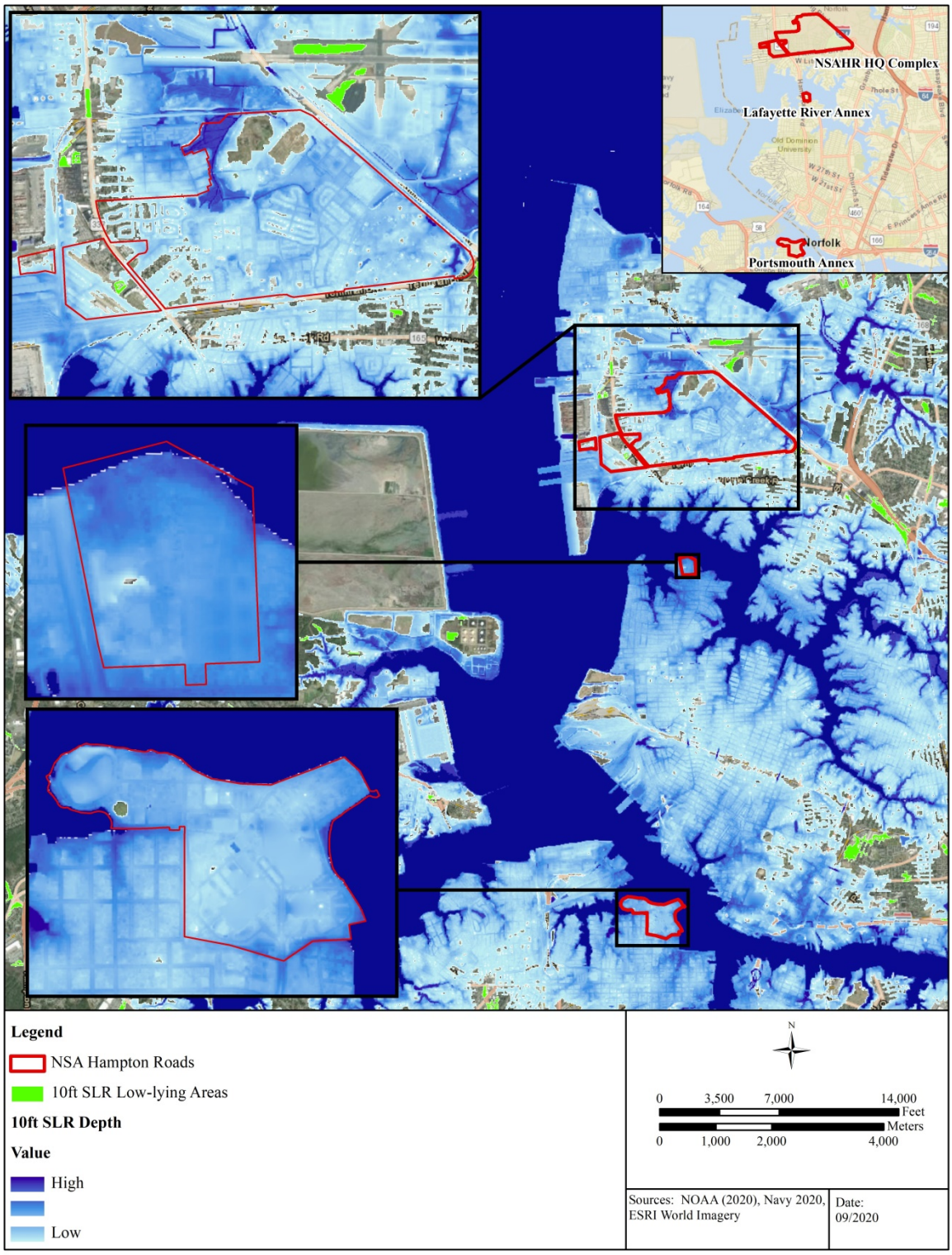

Figure 3-3. Ten feet SLR Scenario for NSAHR HQ Complex, NSAHR LRA, and HSAHR PA.

3.3 Natural Resources Consultation Requirements

Section 7 of the ESA requires federal agencies to consult (formally or informally, depending on the level of effects to species from the proposed action) with USFWS (terrestrial and freshwater organisms) or NOAA-NMFS (marine organisms) when any proposed activity authorized, carried out, or conducted by that agency may affect a listed species or designated critical habitat.

If adverse effects to listed species are anticipated as the result of proposed actions, formal consultation would be required. As a result of formal consultation, USFWS or NOAA-NMFS would issue a Biological Opinion (BO), which would include actions that the federal agency must complete in order to conduct the proposed activity. If critical habitat is located on federal property and adequate protection and management of the critical habitat has been included in the installation INRMP, the ESA allows USFWS to preclude this habitat from the BO. However, in order for the critical habitat to be excluded, the qualifying INRMP must address the maintenance and improvement of the primary constituent elements important to the species and must manage for the long-term conservation of the species. If proposed actions may affect, but are not likely to adversely affect listed species, section 7 consultation can be done informally and without the need to conduct a comprehensive BA. In this case a letter of concurrence would be provided by the appropriate agency with jurisdiction.

The ESA requires USFWS to preclude habitat on federal property that has been identified as essential to the protection and recovery of a listed species from critical habitat designation if adequate special management or protection is provided by an INRMP. The qualifying INRMP must address the maintenance and improvement of the primary constituent elements important to the species and must manage for the long-term conservation of the species.

The USFWS or NOAA-NMFS may decline to designate critical habitat where there exists a plan that provides for the adequate management or protection for listed species. The USFWS uses the following three-point criteria to determine if an INRMP provides adequate management or benefit to species. For each criterion, an explanation of how the INRMP addresses the requirement is provided.

1. **The plan provides a conservation benefit to the species.** The cumulative benefits of management activities identified in a management plan, for the length of the plan, must maintain or provide for an increase in a species' population or the enhancement or restoration of its habitat within the area covered by the plan (i.e., those areas deemed essential for conservation of the species). A conservation benefit may result from reducing fragmentation of habitat, maintaining or increasing populations, insuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies.

2. **The plan provides certainty that the management plan will be implemented.** Persons charged with plan implementation are capable of accomplishing the objectives of the management plan and have adequate funding for implementing the management plan. They have the authority to implement the plan and have obtained all the necessary authorizations or approvals. An implementation schedule (including completion dates) for conservation effort is provided in the plan.

3. **The plan provides certainty that the conservation effort will be effective.** The following criteria are considered when determining the effectiveness of the conservation effort. The plan includes: (1) biological goals (broad guiding principles for the program) and objectives (measurable targets for achieving the goals); (2) quantifiable, scientifically valid parameters that will demonstrate achievement of objectives, and standards for these parameters by which progress will be measured; (3) provisions for monitoring and, where appropriate, adaptive management; (4) provisions for reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort; and (5) a duration sufficient to implement the plan and achieve the benefits of its goals and objectives.

In addition to USFWS consultation requirements for potential impacts to federally listed species, all project and plans, including INRMPs, must be submitted to USFWS via their online project review system to determine if there are federally listed species, critical habitat, or special status species concerns for the installation. Submission of the INRMP for USFWS review using this process will ensure all species identified by USFWS as a concern for the installation have been addressed for the purposes of implementing this INRMP.

The USFWS online project review system is available at:
https://www.fws.gov/northeast/virginiafield/endangered/projectreviews.html.

The Navy provided the NSAHR NWA INRMP prepared for the 2007–2011 plan period to USFWS for review and comment, and comments were received from USFWS on 15 October 2012. Because the planning period for the INRMP was no longer active, the USFWS was unable to sign the document and advised that all future INRMPs or addendums are submitted through their online project review system to determine if there are federally listed species, critical habitat, or other protected species concerns for NSAHR NWA, and to ensure that all species identified by the USFWS are addressed in the INRMP as necessary. Additionally, the USFWS requires that the Navy coordinate with the USFWS Raleigh Ecological Services Field Office for the section of NSAHR NWA located in North Carolina.

3.4 NEPA Compliance

Prior to the 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 the 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 U.S. under the jurisdiction of the Secretary" (Navy 2006a). The Council on Environmental Quality (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 would have a significant impact on the environment, the preparation of an Environmental Impact Statement (EIS) is required. Annual updates and revisions may be covered by the original NEPA documentation unless a major change in the installation mission or natural resources management objectives 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) 5090.6B (navy 2018b) and Chapter 10 of OPNAV M-5090.1 (Navy 2019b for basic guidance on the preparation of NEPA documents. CEQ's "Regulations for Implementing NEPA" and "NEPA's Forty Most Asked Questions" 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, while the intent of the NEPA documentation is to analyze the impacts of the natural resources management actions outlined in the INRMP. While each of these are prepared as separate documents, they should be prepared simultaneously, as it is important for installation NRMs to coordinate preparation of 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 the NEPA process, these should be coordinated and integrated with the INRMP. A FONSI must be achieved before the INRMP can be implemented. 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 2006a). The purpose and need for the INRMP is to meet statutory requirements imposed by the SAIA as well as the requirements of various DOD 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, or too technically or logistically complex should not be included in the analysis. In addition, 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 implementing the natural resources management program. 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 2006a). Analysis in the NEPA document would focus on evaluation and comparison of alternative

plans in association with the natural resources management objectives established for NSAHR by the INRMP. 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 2006a). The projects and recommendations outlined in an INRMP should provide a framework for reviewing ongoing activities and should also assist in reviewing changes for unforeseen projects or modifications in the future. It is important to distinguish that the NEPA analysis for evaluating the NRP is different from the project level of analysis used for project specific actions.

The No Action/Status Quo alternative should always be included as an alternative to implementation of the INRMP. The No Action/Status Quo alternative describes impacts that would occur if the installation did not implement the INRMP and continued to operate without a plan or impacts that would occur if the installation continued to implement the current INRMP that is in place. The No Action/Status Quo 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 natural resources management objectives. Each of the reasonable alternatives may only represent variable intensities of one or more of the natural resources management objectives; 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 included to provide the review agencies and the local community with 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. In addition, controversial projects or projects outside the scope 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 would accommodate for unforeseen projects and changes to original projects. Appendix E of the Navy INRMP guidance document (Navy 2006a) includes more information on preparing NEPA documents for INRMPs.

The final EA prepared for this INRMP, which was prepared upon completion of an environmental review and public comment process, was completed in 2006 (GMI 2006). The EA concluded that there would be positive long- and short-term effects associated with the implementation of the alternatives analyzed (Table 3-1). No Environmental Impact Statement was required. An EA for the Roth Antenna Site Development Plan at NSAHR NWA was completed in 2006 (NSAHR NWA 2006). In addition, NEPA and Coastal Consistency Documentation are available in Appendix B.

Table 3-1. Summary of Potential Impacts and Comparison of Alternatives.

Resource	Alternative 1 No Action Alternative	Alternative 2 Proposed Action	Alternative 3 Enhanced Alternative
Land use	No change	Positive effects on the installation's ability to sustain military land use through protecting soil and water resources and providing information for future land planning.	Same as Alternative 2
Soil Resources	No change	Positive effects from review of sediment control and storm water pollution prevention plans for ground disturbing activities, maintenance of vegetative buffers along agricultural ditches, and visits to construction sites to ensure BMP implementation.	Same as Alternative 2 with additional benefits to soil resources resulting from modifications to major ditches that drain into Mill Stream to reduce erosion.
Water Resources	No change	Positive effects from review of permitting requirements, compliance with wetlands regulations, and implementation of projects including base-wide wetlands delineation, review of storm water pollution prevention and sediment control plans, implementation of BMPs, maintaining vegetative cover along agricultural ditches, and supporting project proponents in obtaining wetlands permits.	Same as Alternative 2 with additional benefits from assessing the hydrology of Mill Stream, evaluating modifications to reduce erosion and trap sediment along major ditches that drain into Mill Stream, and evaluating the restoration of Mill Stream floodplain function, and closing unnecessary roads in forested wetlands.
Coastal Zone Resources	No change	No change	No change
Vegetation	No change	Positive effects from wetlands mapping, invasive species control, implementation of beneficial landscaping, preservation of canebrake rattlesnake habitat, and updating the installation's forest inventory.	Same as Alternative 2 with additional benefits from closing unnecessary roads in forested wetlands and implementing prescribed burning, mowing and other habitat management techniques.
Fish and Wildlife	No change	Positive effects from maintaining habitat for rare species, which will have positive impacts to species with similar habitat requirements; administering hunting and fishing programs to maintain healthy populations; and controlling invasive species.	Same as Alternative 2 with additional benefits from the habitat improvements from the closure of unnecessary roads and habitat management techniques. Benefits to eastern bluebird and purple martins would result from maintenance of nest boxes.

Table 3-1. Summary of Potential Impacts and Comparison of Alternatives, Cont.

Resource	Alternative 1 No Action Alternative	Alternative 2 Proposed Action	Alternative 3 Enhanced Alternative
Threatened and Endangered Species	No change	Positive effects to rare species, canebrake rattlesnake and Dismal Swamp southeastern shrew from projects to preserve the species' habitats.	Same as Alternative 2 with additional benefits from proposed canebrake rattlesnake research and maintenance of early successional habitat for Dismal Swamp southeastern shrew.
Cultural Resources	No change	Positive impacts to undiscovered cultural resources from consultation with SHPO during project planning.	Same as Alternative 2
Air Quality	No change	No significant impacts to air quality are expected.	Same as Alternative 2
Socioeconomics	No change	No change to population, income, or employment.	Same as Alternative 2
Environmental Justice	No change	No disproportionately high adverse impact on minority or low-income populations.	Same as Alternative 2

3.5 Beneficial Partnerships and Collaborative Resource Planning

The diversity of natural resources found at NSAHR 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 natural resources agencies, local colleges and universities, and local conservation groups makes such expertise available to NR personnel to accomplish goals and objectives, as well as fosters good community relationships. The Navy is open to partnering with universities to conduct additional educational and outreach activities on NSAHR. The following is a list of groups and agencies that have formed significant partnerships with NSAHR.

- The USFWS is the federal agency with regulatory oversight of federally listed threatened and endangered species and designates critical habitat for such species. 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 made valuable contributions to the development of this INRMP.
- The USFWS, Gloucester Office of Fisheries Assistance has conducted fisheries surveys of Lunker Lake, Mill Stream, and various waterways at NSAHR NWA. These surveys have historically served as the basis for making fisheries management decisions at the Installation; however, new fisheries data was collected in 2013 to determine if a viable recreational fishing program could be implemented at Lunker Lake.
- The VDWR is the primary wildlife and freshwater fish management agency in Virginia. The VDWR provides environmental analysis of projects or permit applications to determine likely impacts on fish and wildlife resources and habitats and recommends appropriate measures to avoid such impacts. VDWR personnel have been involved in a

number of wildlife surveys at NSAHR NWA (McCoy and Schwab 2000, Pinder 1997, and Schwab 2003a). The VDWR was consulted during the planning stages of this INRMP and INRMP updates and has made valuable contributions to its development.

- In North Carolina, the NCWRC monitors the health and status of wildlife populations and develops and administer programs for their management and sustainable use. The NCWRC was consulted during the planning stages of this INRMP and INRMP updates and has made valuable contributions to its development.
- Staff and students from the Department of Biological Sciences, Old Dominion University have cooperated with NRM staff to conduct a number of wildlife surveys and studies at NSAHR NWA (Binkley and Resetarits 2003, Rose et al. 1988, Savitsky and Petersen 2001, and Savitsky and Petersen 2004).
- The Virginia Herpetological Society has conducted reptile and amphibian surveys at NSAHR NWA that provides valuable information for the management of these species (Pinder 1997).
- The Smithsonian Conservation Biological Institute completed spotted turtle survey efforts under the DoD Legacy Program voluntarily at Northwest Annex. Future surveys are expected to occur as funding allows.
- The Elizabeth River Project partners with the installation in an effort to conserve and protect critical shorelines along NSAHR LRA and NSAHR PA as well as help contribute to a cleaner Chesapeake Bay Watershed through an oyster gardening effort at both installations.
- The Institute for Bird Populations conducted mist netting surveys to access bird population survivorship and productivity as part of the Monitoring Avian Productivity and Survivorship Program between 1995 and 2003.
- Virginia Department of Conservation and Recreation–Division of Natural Heritage (VDCR-DNH) conducted a rare, threatened, and endangered species survey at NSAHR NWA (Belden 1993).
- Sportsman's Quality Management Board volunteers work closely with NR personnel to assist with projects that promote ethical hunting.
- Elizabeth City State University constructed a boardwalk through part of the swamp forest to promote education and research and is involved with periodic maintenance and use of the boardwalk.
- Christopher Newport University worked with the Navy and Geo-Marine, Inc., to restore Atlantic white cedar (*Chamaecyparis thyoides*) at two sites on NSAHR.
- NSAHR is a member of the South Atlantic Landscape Conservation Cooperative (SALCC), Society for Ecological Restoration International, and other regional conservation partners in an effort to develop adaptation strategies to deal with climate change.
- Other stakeholders that have formed partnerships with NSAHR include the City of Chesapeake, Virginia; Currituck County, North Carolina; NOAA; North Carolina

Department of Environment and Natural Resources; North Carolina Natural Heritage Commission; USACE; USDA NRCS; USDA Wildlife Services; EPA; U.S. Forest Service; USGS; Virginia Army National Guard; Virginia Department of Forestry; Virginia Department of Health; Center for Conservation Biology; College of William and Mary; Cooperative Ecosystems Studies Unit; DoD Partners for Amphibian and Reptile Conservation; National Audubon Society; North Carolina Native Plant Society; TNC chapters of Virginia and North Carolina; and Virginia Native Plant Society.

- NSAHR LRA routinely supports shoreline habitat restoration, buffer enhancement, and oyster gardening projects through partnerships with local and regional support groups like the Elizabeth River Project and Chesapeake Bay Foundation.
- NSAHR PA is surrounded by the Elizabeth River, which is currently the focus of the Chesapeake Bay Programs initiatives to clean the bay.

3.6 Public Access and Outreach

3.6.1 Land Use

Land use at NSAHR HQ Complex consists of mostly developed land use/cover. Natural resources at NSAHR HQ Complex include wetlands, forest buffers, streams, and vegetation; however, these resources are limited and not frequently impacted by the military mission. See Figure 2-3 for training and operational facilities and their encumbered areas, and other land use areas for NSAHR HQ Complex.

NSAHR LRA consists of mostly developed land use/cover and serves an important role in maintaining the health and vigor of the Lafayette River, having nearly 1,200 feet (366 m) of shoreline habitat. Natural resources at NSAHR LRA include oyster gardens, small wetlands, and shoreline buffers and plantings; however, these resources are limited and not impacted by the military mission of NSAHR LRA. NSAHR LRA routinely supports shoreline habitat restoration, buffer enhancement, and oyster gardening projects through partnerships with local and regional support groups like the Elizabeth River Project and Chesapeake Bay Foundation. See Figure 2-3 and Section 2.6 Constraints and Opportunities at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA for training and operational facilities and their encumbered areas, and other land use areas for NSAHR LRA.

While natural resources are minimal and land use/cover is primarily developed at NSAHR PA, the Installation does support environmental goals and objectives. Natural resources at NSAHR PA include oyster gardens, wetlands, shoreline buffers and plantings, and a pollinator garden. NSAHR PA is also surrounded by the Elizabeth River, which is currently the focus of the Chesapeake Bay Programs initiatives to clean the bay. See Figure 2-3 and Section 2.2 Constraints and Opportunities for training and operational facilities and their encumbered areas, and other land use areas for NSAHR PA.

Land use classifications for NSAHR NWA are based on outstanding physical features such as developed, forest, maintained open or agricultural land (Table 3-2). See Figure 2-4 and Section 2.2 for information on NSAHR NWA's training and operational facilities and their encumbered areas and other land use areas (National Land Cover Database 2016).

Table 3-2. Land Use/Cover Classification of NSAHR NWA.

Land Use/Cover	Acres
Forest	2,345
Agriculture	750
Maintained Open	295
Developed	271
Total	**3,661**

3.6.2 Human and Wildlife Conflicts/Safety Concerns

Individuals who recreate and other personnel that live or work on NSAHR should be aware that there is the potential for venomous snakes and poisonous plants to be present. Wearing protective clothing and hiking boots can reduce the risk of contact with poisonous plants and venomous snakes. Individuals should remain on designated trails and avoid walking through dense piles of brush. If snakes are observed, individuals should avoid disturbing them, as they are not likely to strike unless provoked. If an individual is bitten by a snake, he or she should seek immediate medical attention. All wildlife incidences should be reported to the local Environmental Office, Safety Office, and/or Security Office. Fact sheets on poisonous plants and venomous snakes are included in Appendix G.

The information, including geographic distribution, plant characteristics, and treatment for the most common poisonous plants in the U.S. is available at:

http://www.cdc.gov/niosh/topics/plants/

3.6.3 Wildlife Diseases

Individuals who recreate and other personnel that live or work on NSAHR are at risk for zoonosis, diseases that are communicable from animals to humans under natural conditions. Zoonotic diseases of concern at NSAHR include Lyme disease, West Nile virus, equine encephalitis, rabies, and distemper, and with the documentation of feral hogs at NSAHR NWA there are additional disease threats associated with this species that may be communicable to humans, livestock, or other species. To help prevent the spread transmission of these diseases, the NRM should promote preventative measures and post notices of disease outbreaks that may affect NSAHR personnel and guests. Fact sheets on zoonotic diseases of concern at NSAHR are included in Appendix G.

Information on zoonotic diseases, including how to prevent the spread of the diseases, is provided by the Centers for Disease Control and Prevention and is available at:

http://www.cdc.gov/ncezid/

3.6.4 Environmental Awareness

Nature Trail Interpretive Sign

Installation environmental staff or other personnel as appropriate are responsible for coordinating environmental education and outreach efforts at NSAHR. Environmental staff and other personnel coordinate annual events such as Arbor Day, Earth Day, Clean the Bay Day, International Migratory Bird Day, and Invasive Plant Removal Day, which are important for promoting environmental awareness at NSAHR. Through such activities, residents and volunteers at NSAHR have the opportunity to learn about environmental stewardship as well as contribute to the protection and enhancement of local ecosystems. NSAHR residents and volunteers also are encouraged to participate in habitat improvement through a wide variety of natural resources projects such as wildlife surveys and trail maintenance. Additional safety concerns for NRM's presenting environmental awareness issues include the presence of poisonous plants and venomous snakes, black bears, and potential exposure to zoonotic diseases. Appendix G contains materials that can be used for educational outreach to the public with regards to natural resources management at NSAHR, including pamphlets and brochures about safety hazards such as poisonous plants, venomous snakes, black bears, and zoonotic diseases; wildlife compliance; pets; and walking, hunting, fishing, and firewood collection opportunities at NSAHR.

In 1999, the NRP developed a self-guided interpretive nature trail at NSAHR NWA to enhance environmental awareness and enjoyment (Appendix G). Eleven (11) interpretive signs posted along the trail provide information on native flora and fauna and natural communities of the region. The trail begins near Building 404 and winds through fields and forest for 3.8 mi (6.1 km) (Figure 3-4). In 2003, Hurricane Isabel severely damaged the trail and interpretive signs. Clearing debris and restoring the interpretive trail is a stewardship activity that is dependent on the availability of volunteer labor and funding.

NSAHR NWA also provides access to a 1-mile (2-km) long boardwalk through a portion of the Great Dismal Swamp that offers a self-guided educational wetlands tour (Figure 3-4). The boardwalk is located on a 639-ac (259-ha) parcel of land that is leased by Elizabeth City State University and is used by university students and personnel and other groups upon request. Originally the university was responsible for conducting all maintenance of the boardwalk; however, the Navy currently provides assistance with boardwalk maintenance as part of a goodwill partnership. The Navy NRP volunteers and staff members have been providing assistance since 2010 when the Navy initiated a National Public Lands Day Event in partnership with a Cooperative Ecosystems Study Unit to repair the boardwalk after several years of storm damage and vegetation overgrowth. The Cooperative Ecosystems Study Unit has not contacted the NRM since 2011.

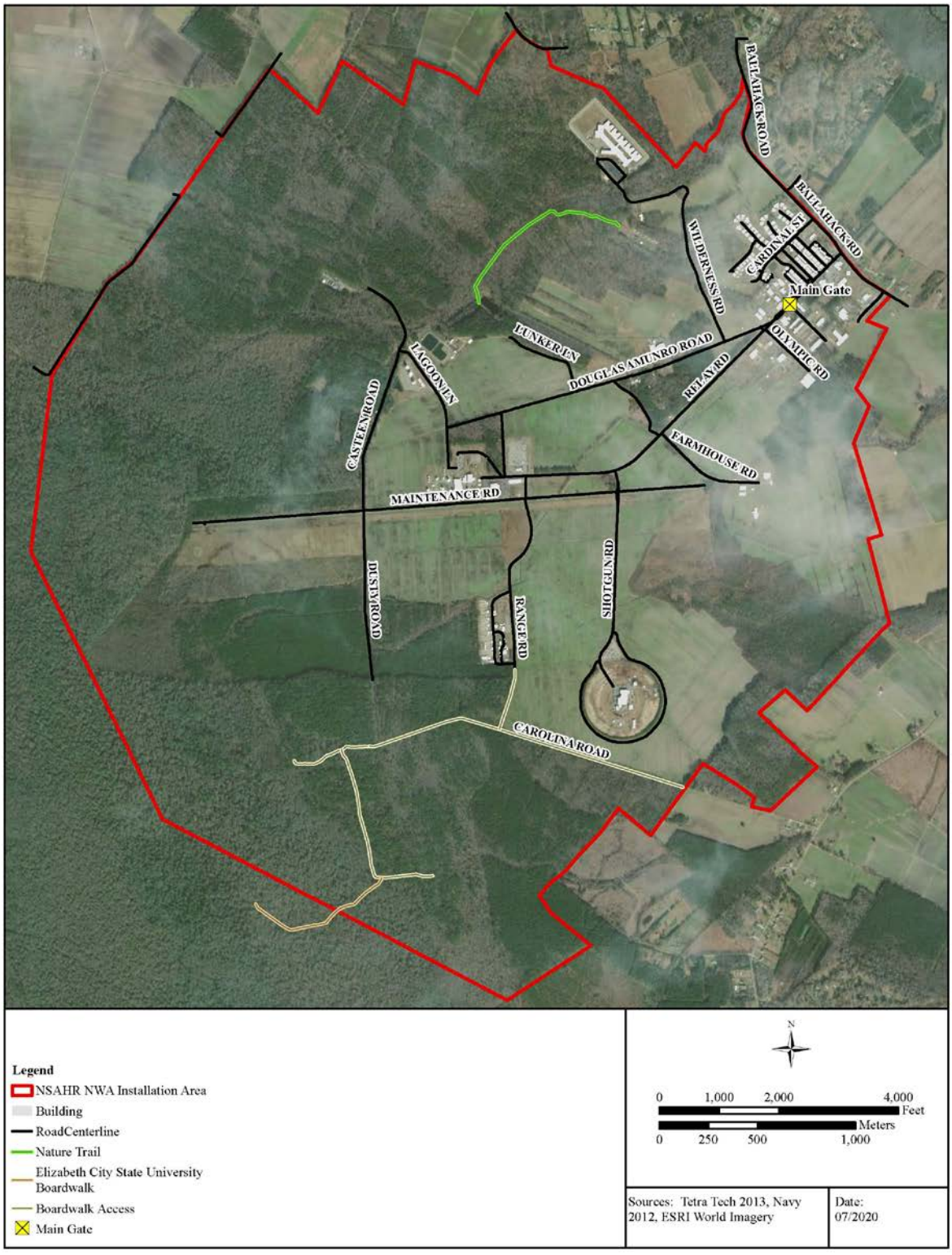

Figure 3-4. Outdoor Recreation Facilities of NSAHR NWA.

Prior to 2004, Building 404 served as the NSAHR NWA's Environmental Education Center and housed environmental and cultural resources exhibits and a natural resources library. The center was available for use by local school groups and scout troops for educational programs. This facility is now used as a regional conference center and is managed by MWR.

The NRP also accepts requests to conduct natural resources safety awareness and wildlife training classes/talks at NSAHR. Availability of Navy staff to conduct these outreach events is limited, and staff may not be available during the desired training request time frame; however, staff will attempt to make arrangements for another date or will recommend other sources from which to obtain similar information.

3.7 Encroachment Partnering

The Navy defines encroachment primarily as any non-Navy action, planned or executed, that inhibits, curtails, or possesses the potential to impede performance of Navy activities. The DoD has established an Encroachment Partnering program, which was authorized under 10 USC §2684a (Agreements to Limit Encroachments and other Constraints on Military Training, Testing and Operations), and authorizes military services to enter into cost-sharing partnerships with states, their political subdivisions, and/or conservation minded non-governmental organizations (NGOs) to acquire land interests from willing sellers. This serves to limit development or use of the acquired property interest and preserve habitat that supports military readiness requirements. Undeveloped habitat areas that border NSAHR present ideal opportunities for the Navy to establish buffers to separate its properties from encroaching development.

An Encroachment Action Plan (EAP) is a tool and blueprint process whose purpose is to identify, quantify, mitigate, and prevent potential encroachment challenges to an installation or a range. The installation Community Plans & Liaison Officer, coordinating with the NAVFAC Real Estate office, will submit plans and budget requirements for all land interest acquisition proposals addressing encroachment, including encroachment partnering projects, to Commander, Navy Installations Command for evaluation and coordination (NAVFAC no date [n.d.]). The original EAP for NSAHR was completed in 2008 and addressed encroachment-related issues affecting an installation, range, or operating area and describes recommended mitigation strategies at NSAHR HQ Complex and NSAHR LRA; this EAP was updated in 2015 (Navy 2015a). EAPs for NSAHR PA (Navy 2015b) and NSAHR NWA were published separately since these installations were brought under NSAHR after 2008.

The DoD Readiness and Environmental Protection Integration (REPI) program enables the military to work with willing partners who help provide cost-sharing land conservation solutions to limit incompatible development and protect valuable open spaces and habitat around key operational, test and training areas. The DoD REPI provides funding for the military, on an annual competitive basis, to work with state and local governments, NGOs, and willing landowners to help prevent encroachment. Through 2019, DoD and its partners have spent nearly $145 million on REPI projects at 8 installations in Virginia and $181 million on projects in North Carolina (DoD 2019b, 2019c).

Through the REPI program, the Navy partnered with the City of Chesapeake to reduce electromagnetic interference that can severely impact the Relocatable Over-the Horizon Radar (ROTHR) system's operation by inhibiting the system's ability to process accurate signals. The Navy Multi-Year Agreement/REPI facilitates a partnership between the City of Chesapeake and the Navy allowing for the purchase of restrictive easements within electromagnetic interference impact zones, preventing development that would produce interference. Through this program, two properties were acquired: Gees Group Property (639 ac), and Philippians Property (43 ac) (City of Chesapeake 2018).

A Joint Land Use Study (JLUS) was completed in 2019 and published in 2020 as a joint effort between the City of Norfolk and Virginia Beach, and four Navy Installations within the Hampton Roads region: Joint Expeditionary Base Little Creek-Fort Story, Naval Air Station Oceana, Naval Station Norfolk, and NSAHR. The study specifically considers how flooding and sea level rise affect community assets and infrastructure and how those effects impact military operations and readiness in Hampton Roads. Several projects and policies are identified in the study that the cities can pursue to mitigate impacts of flooding and sea level rise on Navy operations (AECOM et al. 2019).

The City of Chesapeake adopted the *Forward Chesapeake 2026 Comprehensive Plan* in 2005, which provides an overarching vision for the development of the city. Focuses of the plan include better community design, community connectivity, and an increased focus on natural amenities. The plan includes a policy document, a land use plan, and a master transportation plan. The City of Chesapeake is committed to actively working with the Navy to address land use issues associated with operation of Navy installations in the region (Chesapeake Planning Department 2005). A review initiative, *Moving Forward – Chesapeake 2035*, of the 2026 plan commenced in 2009, was adopted by City Council in February 2014, and was amended in November 2016 (Chesapeake Planning Department 2016).

The County of Currituck, North Carolina adopted the *2005 Currituck County Land Use Plan* in 2006, and the plan was amended in 2008 and 2009. The plan was prepared by the Currituck County Planning Board, Board of Commissioners, and Planning Department, and was prepared in accordance with the requirements of the North Carolina Coastal Area Management Act, the North Carolina Resources Commission Land Use Planning Requirements, and the Local Planning and Management Grants. The plan focuses on the physical development of the county and contains policy recommendations about the suitable and appropriate use of the land and provision of public services (Currituck County Planning Board 2006).

A BASH management program has been implemented at NSAHR PA to address concerns associated with a helicopter landing site utilized for emergency use. A 5-mile (8.0 km) buffer has been established around NSAHR NWA that is managed for multiple purposes, including, but not limited to, conservation, communication frequency, and BASH concerns associated with an Installation helicopter landing site that is currently operational. NSAHR will continue to work with local, state, and federal authorities to reduce encroachment and operational impediments that could impact military readiness. Participation in the development of land use plans at the city and county level can prevent future encroachment and adjacent land use issues.

3.8 State Comprehensive Wildlife Plans

The State and Tribal Wildlife Grants program was created by Congress in 2000 to fund actions to conserve declining fish and wildlife species before they become threatened or endangered. It is the core federal program for preventing future endangered species listings. A primary condition for states to be eligible for matching grants is to develop a State Wildlife Action Plan (SWAP) that provides an assessment of the health of wildlife and habitats, identifies the problems they face, and outlines conservation actions. In the August 2006 memorandum that provided DOD's official INRMP template, DoD identified the incorporation of SWAPs into INRMPs, and vice versa, as a critical element of the environmental management strategy and mission sustainability. In order to achieve the goals established by the Sikes Act via mutually agreed-upon fish and wildlife conservation objectives, NSAHR has consulted the Virginia and North Carolina SWAPs.

The 2015 Virginia SWAP identified 883 wildlife species of greatest conservation need in Virginia, 30 percent of which are vertebrates, and 70 percent of which are invertebrates. These species are further grouped into four tiers of relative conservation need: critical (I), very high (II), high (III), and moderate (IV) (VDGIF 2015a). Of the 883 species identified in the SWAP, 139 species occur or historically occurred within the Hampton Roads Planning Region. The Virginia SWAP describes opportunities to maintain and improve natural habitats and details efforts to restore rivers, maintain forests, and prevent species from declining to the point where federal protections are imposed.

The 2015 North Carolina SWAP identified 409 wildlife species of greatest conservation need, 70 percent of which are vertebrates and 30 percent of which are invertebrates. The SWAP also identifies Knowledge Gap Priority Species and Management Concern Priority Species (NCWRC 2015).

NSAHR conducts various projects that affect the conservation of sensitive species and habitats, which include, but are not limited to:

- conducting routine surveys/monitoring of species of greatest conservation need and habitats, including for migratory birds, bats, and marine mammals;
- minimizing the loss habitat;
- controlling invasive and nuisance species; and
- restoring important habitats such as streams, forest buffers, and wetlands.

4.0 PROGRAM ELEMENTS

This section provides detailed information on the primary natural resources management program elements identified for all properties of NSAHR. Specific projects and actions have been developed that will assist the installation in meeting the established goals and objectives. No impacts on the mission are expected to occur from implementation of the natural resources management goals and objectives described in this section; however, if special considerations are necessary, these are described where applicable.

4.1 Rare, Threatened, and Endangered Species Management

Regulatory protection for threatened and endangered species on military installations is provided by federal endangered species laws. The ESA requires all federal agencies to ensure that any action undertaken is not likely to jeopardize the continued existence of a federally listed threatened or endangered species. In Virginia, the VDCR Natural Heritage Program (VDCR-NHP) is responsible for inventory, database maintenance, protection, and management of Virginia's natural heritage resources under Code of Virginia §29.1-564-568. These resources include habitats of rare, threatened, or endangered plant and animal species; state significant communities; and other natural features. In addition, the VDWR protects and manages the state's wildlife and freshwater fish resources and is responsible for the protection and management of all of Virginia's wildlife species, including threatened or endangered species, excluding listed insects. The VDCR-NHP and VDWR track the current status of natural heritage and wildlife resources in their respective databases, which are available on their websites. In North Carolina, the North Carolina ESA (North Carolina General Statutes 113-331 and 113-337) is administered by the NCWRC. Under both state laws, it is illegal to take, possess, transport, sell, barter, trade, or export any animal on the protected list without a permit. The North Carolina Natural Heritage Program documents the status and distribution of the rarest plants and animals by working closely with experts from across the state and in cooperation with the USFWS, the Plant Conservation of the North Carolina Department of Agriculture and Consumer Services and the Nongame and Endangered Wildlife Program of the NCWRC.

Any authorization, funding, or undertake of an action that may adversely affect essential fish habitat (EFH) by a federal agency requires consultation with NOAA Fisheries. Adverse effects on EFH are any direct or indirect effects that reduce the quality and/or quantity of the habitat. These effects can range in spatial scales from large ocean uses to small projects along the coast. NOAA Fisheries provides advice and recommendations to the federal agency to avoid, reduce, or offset these adverse effects. As part of the EFH consultation, federal agencies must submit an EFH assessment to NOAA Fisheries, which must include:

- A description of the action;
- an analysis of the potential adverse effects of the action on EFH, and the managed species, the federal agency's conclusions regarding the effects of the action on EFH; and
- proposed mitigation (if applicable).

Additional information such as an analysis of alternatives, the results of on-site inspections, literature reviews, or the views of recognized experts, may also be necessary depending upon the scale and nature of the adverse effects to EFH.

No rare, threatened, or endangered species have been identified at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Northern long-eared bat is currently listed as threatened under the ESA by the USFWS and is known to occur at NSAHR NWA. Three state listed species in Virginia, Rafinesque's big-eared bat, Dismal Swamp southeastern shrew, and timber (canebrake) rattlesnake Coastal Plain population, have been identified at NSAHR NWA (GMI AECOM 2019). Current surveys and management of these species at NSAHR NWA are described below. No threatened or endangered species have been observed during surveys within the North Carolina portion of NSAHR NWA. Threatened and endangered species reported by IPaC can be found in Appendix F.

Projected climate change impacts to natural resources, as described in Sections 2.7.2 and 3.2, could result in significant impacts to rare, threatened, and endangered species, and their habitats. The effects of climate change on wildlife are highly variable, including geographic range shifts, changes in relative species abundance, phenology, and other ecological aspects of their biotic communities. There is already evidence of disruptions in community dynamics, such as predator-prey and plant-insect interactions, alterations in biogeochemical cycles, and increased disease, pest, and non-native species invasions. The rapid pace of recent environmental change increases the threat of extinction, as species are not able to adapt to changing environments quickly enough. Specific climate change stressors that can impact rare, threatened, and endangered species include increases in sea level; increases in surface and ocean temperatures; increases in carbon dioxide concentrations; changes in precipitation; increases in diseases, pests, and non-native species; drought; recurring flooding; desertification; wildfires; thawing permafrost; and increases in the frequency and severity of storm events (Society for Ecological Restoration International 2009, DoD 2019).

The Virginia SWAP identifies climate change as a significant threat to various species discussed in the action plan (VDGIF 2015a). The VDWR, in collaboration with the National Wildlife Federation and Virginia Tech's Conservation Management Institute, designed a project to create spatially explicit climate forecasts, determine the magnitude and occurrence of future climate changes, and describe the impacts that those climate changes may have on the distributions of a selection of SGCN species and their habitats. The North Carolina SWAP discusses the three factors that are expected to impact wildlife in the state, which include sea level rise- temperature changes, and precipitation changes (NCWRC 2015).

4.1.1 Northern Long-Eared Bat

The northern long-eared bat was identified at NSAHR NWA during bat acoustic and mist netting surveys conducted in 2013, during baseline acoustic surveys and two capture surveys conducted in 2015, and during capture surveys conducted in 2019 (Tetra Tech and Stell Environmental Enterprises 2015, Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b, Tetra Tech and Stell Environmental Enterprises 2019). Management for northern long-eared bat and other bat species, including protection of potential habitat and monitoring of bats at NSAHR NWA, is an important component of threatened and endangered species protection at the Installation. Dependent upon available funding, additional bat

surveys will be conducted in the near future. NSAHR NWA also contains several bat boxes that were installed as part of the Installation Nest Box Program (see Section 4.4.4).

4.1.2 Rafinesque's Big-Eared Bat

The Rafinesque's big-eared bat was identified at NSAHR NWA during bat acoustic and mist netting surveys conducted in 2013, during baseline acoustic surveys and two capture surveys conducted in 2015, and during capture surveys conducted in 2019 (Tetra Tech and Stell Environmental Enterprises 2015, Tetra Tech and Stell Environmental Enterprises 2016a, Tetra Tech and Stell Environmental Enterprises 2016b, and Tetra Tech and Stell Environmental Enterprises 2019). Rafinesque's big-eared bat is a Virginia endangered species and North Carolina species of special concern. Management of bat species at NSAHR NWA includes protection of potential habitat and monitoring as part of the Installation's threatened and endangered species protection and management activities. Dependent upon available funding, additional bat surveys will be conducted in the near future. NSAHR NWA also contains several bat boxes that were installed as part of the Installation Nest Box Program (see Section 4.4.4).

4.1.3 Dismal Swamp Southeastern Shrew

Dismal Swamp southeastern shrew was identified at NSAHR NWA during Natural Heritage Inventory and Milkweed surveys in 2018 (GMI AECOM 2019). The Navy prepared a Biological Assessment and the USFWS prepared a Biological Opinion on the Dismal Swamp southeastern shrew for NSAHR NWA when the species was proposed for listing. Although consultations with the USFWS are no longer required for activities outside the potential Dismal Swamp southeastern shrew habitat designated by USFWS at NSAHR NWA, continued protection of the habitat is the best management option for the species. Habitat management measures such as maintaining areas with dense thickets of cane and closing unnecessary road access to the forested wetlands are proactive measures that can help ensure the Dismal Swamp southeastern shrew's continued survival.

4.1.4 Timber (Canebrake) Rattlesnake Coastal Plain Population

Although habitat loss, human encroachment, and human predation have made the timber (canebrake) rattlesnake Coastal Plain population rare throughout most of its Virginia range, the large tracts of intact habitat found at NSAHR NWA provide for its relative abundance at the Installation. Therefore, the primary protection strategy for the timber (canebrake) rattlesnake Coastal Plain population at NSAHR NWA is to continue to maintain large, contiguous tracts of mature forests (particularly deciduous) and areas of early successional habitats at the Installation. Land use changes that impact these resources should be coordinated with NR staff to avoid or minimize adversely impacting timber (canebrake) rattlesnake populations. Because of the extensive damage caused by Hurricane Isabel in 2003, continued research on habitat utilization and movement is needed to provide information regarding habitat loss and its effects on the species for future management.

The VDWR recommends mowing of any areas adjacent to forested wetlands be performed only during the winter months, which are hibernation periods for the species, so as to avoid striking them with mowers. Other areas should be mowed frequently enough (weekly) so that the grass does not obscure the location of timber (canebrake) rattlesnakes, making them more susceptible to

strikes. The VDWR also recommends that all mowing contractors receive training in the identification and status of this species (VDGIF 2015a). The NCWRC recommends maintaining and restoring floodplain forest connectivity since they serve as important distribution and dispersal corridors for timber (canebrake) rattlesnake (NCWRC 2015).

The NRM, in coordination with NAVFAC Atlantic and VDWR, has developed a Natural Resources Awareness PowerPoint presentation, which includes information on how to identify timber rattlesnakes, avoiding negative human and wildlife impacts, and contact information for reporting observations. This brief, along with other pertinent brochures, should be provided to all contractors, tenants, staff, students, and other relevant personnel that utilize any properties of NSAHR. Contractors and tenants may request a formal presentation of this material for their staff, where the NRM or other authorized personnel will provide the briefing in person Contractors should post relevant information on timber rattlesnakes to their Safety Bulletin Boards. At a minimum, information stating that it is illegal to kill this snake species and that it is required to report observations of this snake species to the NRM should be included on these postings/notifications.

Educating NSAHR personnel and residents about the presence of this state-protected species and the benefits of snakes in general is another protection strategy that has been undertaken at NSAHR. A pamphlet developed by the NAVFAC Mid-Atlantic Environmental Division provides descriptions of venomous snakes associated with the Hampton Roads region of Virginia and provides guidelines on how to avoid disturbing them (Appendix G). The continued production and distribution of this pamphlet will further benefit the timber (canebrake) rattlesnake Coastal Plain population.

4.1.5 American Eel

American eel had previously been documented at NSAHR within Mill Stream and Lunker Lake at NSAHR NWA; however recent inventories have not documented this species. American eel was petitioned for listing under the federal ESA in 2010, but in 2015 the USFWS decided that listing American eel was not warranted. The American eel, found in freshwater, estuarine, and marine habitats, has been extirpated from portions of its historical freshwater habitat during the last 100 years, primarily resulting from the construction of dams through the 1960s. Other threats are associated with habitat loss, overharvesting, degradation of current habitat, and mortality in hydropower plant turbines. Management of natural resources to protect water resources, including water quality, and implementation of erosion and sediment control measures will provide benefit to American eel habitat.

4.1.6 Red-cockaded Woodpecker

Red-cockaded woodpecker has not been identified on any NSAHR installation at this time, or during any bird survey at NSAHR NWA; however, the closest known occurrences are approximately 6 miles west of NSAHR NWA (John Hammond, personal communication). The species is primarily found in the Southeast occupying longleaf pine ecosystems. These pine forests are intricate in the survival of these species along with prescribed burning practices. The longleaf pine ecosystem has been severely impacted due to commercial timber harvesting, urbanization, and agriculture. Red-cockaded woodpeckers may use many different stand types, but in this part of their range, research shows stands are not pine dominated and may contain only one or two pine

trees greater than 14 inches DBH per acre. Management of natural resources to protect the natural ecological state(s) of pine stands and longleaf, may have the potential to benefit the Red-cockaded woodpecker.

4.2 Wetland and Deep Water Habitat Management

4.2.1 Wetlands and Water Quality Protection

Due to their importance to the health of the ecosystem and the human environment, a large number of state, federal, and local laws regulate land uses and actions with the potential to impact wetlands and water quality. This section provides a brief overview of the primary laws regarding waters of the U.S.

Rivers and Harbors Act – Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.) requires authorization from the USACE for the construction of any structure in or over any navigable waters of the United States, the excavation/dredging or deposition of material in these waters, or any obstruction or alteration in a "navigable water." "Navigable waters" of the United States are those subject to the ebb and flow of the tide shoreward to the mean high water mark and/or that are used, or have been used in the past, or are susceptible for use to transport interstate or foreign commerce. The term includes coastal and inland waters, lakes, rivers and streams that are navigable, and the territorial sea. Structure or work outside the limits defined for navigable waters of the United States require a Section 10 permit if the structure or work affects the course, location, condition, or capacity of the water body.

Clean Water Act – The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. CWA became the Act's common name with amendments in 1977. Under the CWA, the EPA has implemented pollution control programs such as setting wastewater standards for industry. In addition, the agency also set water quality standards for all contaminants in waters of the United States, including wetlands. The CWA made it unlawful to discharge any pollutant from a point source into waters of the United States, unless a permit was obtained. The term "pollutant" is defined by the CWA as: dredged spoil; solid waste; incinerator residue; sewage; garbage; sewage sludge; munitions; chemical wastes; biological materials; radioactive materials; heat; wrecked or discarded equipment; rock; sand; cellar dirt; and industrial, municipal, and agricultural waste discharged into water.

Section 404 of the CWA, which is jointly administered by the USACE and USEPA, regulates the discharge of dredged or fill material into "waters of the United States," which include wetlands. Discharge of dredged or fill material requires a permit from the USACE based on regulatory guidelines developed in conjunction with USEPA (pursuant to Section 404(b)(1)).

USACE Wetlands Permits – USACE wetlands permits are broken down into two categories:

(1) General Permits, which consist of nationwide, regional, or statewide permits issued based on specific categories of activities that, when conducted in waters of the United States, are presumed to cause only minimal adverse environmental impacts.

(2) Individual Permits, which are required for activities with more significant wetland impact potential. Individual permit applications are evaluated on a case-by-case basis using the Section 404(b)(1) Guidelines. The Guidelines spell out a sequential review process which requires the applicant first show that all available alternatives to the impact (the "discharge of dredged or fill material") have been considered, and that no practicable alternative exists which would have less adverse impact on the aquatic ecosystem. Non-water-dependent activities face a more rigorous evaluation from the USACE. Next, no discharge can be permitted if it would violate other applicable laws, including state water quality standards, toxic effluent standards, the ESA, and marine sanctuary protections. Further, the discharge "cannot cause or contribute to significant degradation of wetlands by adversely impacting wildlife, ecosystem integrity, recreation, aesthetics, and economic values." If these conditions are met, then the applicant must show that all appropriate and practicable steps will be taken to minimize adverse impacts of the discharge on wetlands. Only after avoidance and minimization criteria are satisfied can the USACE consider compensation. In establishing mitigation requirements, the USACE must strive to achieve a goal of no overall net loss of wetland values and functions.

Section 10 and CWA 404 overlap in some activities involving wetlands. Permits for activities regulated under both are processed simultaneously by the USACE.

Executive Orders – EO 12088, *Federal Compliance with Pollution Control Standards* and EO 11990, *Protection of Wetlands* require federal facilities to comply with all substantive and procedural requirements applicable to point and nonpoint sources of pollution. These EOs direct federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. In accordance with these requirements, NSAHR must obtain all appropriate federal, state, interstate, and local certifications and permits required by point and nonpoint pollution control, groundwater protection, dredge and fill operations, and stormwater management programs for any action that may impact water quality. 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.

Virginia State Law – In addition to federal protections, wetlands are also afforded protection under Virginia state law. The Virginia Tidal Wetlands Act of 1972 makes wetland protection mandatory and gives regulatory authority to VMRC and VDEQ. VMRC regulates any activity that disturbs tidal wetlands through the issuance of a permit.

Chapter 12 of Title 28.2 of the Code of Virginia also gives VMRC responsibility for regulation over any activities that build on, dump into or encroach upon the beds of the bays and ocean, rivers, streams, creeks that are the property of the state.

VDEQ regulates wetlands disturbing activities under Virginia Code Sections 62.1-44.2 et seq. and 62.1-44.15:5. VDEQ's Virginia Water Protection Program (9 Virginia Administrative Code [VAC] 25-210) regulates wetlands disturbing activities by issuing Virginia Water Protection permits for both tidal and non-tidal wetlands. The Virginia Water Protection Permit Program 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
- 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/Programs/Water/WetlandsStreams/PermitsFeesRegulations.aspx

VDEQ issues General Permits without public notice for certain activities involving "minimal impacts." Individual Permits with public notice are issued for projects with significant impacts. Individual tidal wetlands permits are issued pursuant to 9 VAC 25-210 et seq. and Section 401 of the CWA Amendments of 1977.

North Carolina State Law – The North Carolina Department of Environmental Quality Water Quality Permitting Section consists of seven branches responsible for permitting and compliance of wastewater, as well as for implementing regulatory programs for state waters, wetlands, and riparian buffers. These branches include:

- The Industrial Permitting Branch
- The Municipal Permitting Branch
- The Compliance and Expedited Permitting Branch
- The Non Discharge Permitting Branch
- The 401 & Buffer Permitting Branch
- The 401 & Buffer Transportation Permitting Branch
- The Animal Feedings Operations Branch

More information on the North Carolina Department of Environmental Quality Water Quality Permitting Section is available at:
https://deq.nc.gov/about/divisions/water-resources/water-resources-permits

Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management – As established in the UFP for a Watershed Approach to Federal Land and Resource Management (65 FR 62565-62572), NRMs will use a watershed-based approach to manage operations, activities, and lands to avoid or minimize impacts to wetlands, groundwater, and surface waters on or adjacent to any properties of NSAHR in accordance with the guidelines and goals.

Detailed information regarding current CWA regulatory programs of the USACE is available at: http://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Related-Resources/CWA-Guidance/

Climate Change – Climate change-induced sea-level rise has the potential to affect wetlands and water quality at NSAHR. Installation engineers, planners, and NRMs utilize the following documents to identify and assess climate change adaption action alternatives to ensure the long-term sustainability of installation natural resources and infrastructure:

- Climate Change Adaptation for Department of Defense Natural Resources Managers (Navy 2019d)
- Climate Change Installation Adaption and Resilience: Planning Handbook (NAVFAC 2017)
- Sea Level Change Framework Report (NAVFAC 2016)
- Assessing Impacts of Climate Change on Coastal Military Installations (SERDP, 2013)
- Virginia's Climate Modeling and Species Vulnerability Assessment: How Climate Data Can Inform Management and Conservation (National Wildlife Federation, 2013)
- Climate Change in Hampton Roads: Impacts and Stakeholder Involvement (Hampton Roads Planning Commission, 2010)
- Climate Change Impacts in Virginia: Status of Natural Resource Data Records as Tools to Assess Continuing Trends (Rudnicky et al. 2009)

4.2.2 Wetlands Protection

As described above, NSAHR will comply with the federal laws and regulations in place for protection of wetlands. 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 0.5 ac (0.2 ha), though notification to the District Engineer for activities that result in the loss of greater than 0.1 ac (0.4 ha) of waters of the United States or exceed other criteria noted within the NWPs is generally required (67 FR 2080). If project impacts are expected to exceed these criteria, an individual permit must be sought.

NSAHR 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*, as described above, and the White House Office on Environmental Policy. A recommended action would include obtaining a jurisdictional determination for wetlands at all sites so potential impacts could be avoided early in the planning process. Although permits may be obtained that allow for the filling of wetlands, in accordance with EO 11990, federal agencies may do so only after attempting to find 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 offsite mitigation bank or in-lieu fee instrument is encouraged as sound conservation planning, as authorized by Section 2694(b) of Title 10, U.S.C. Offsite mitigation may provide a preferred alternative to meeting watershed protection and ecosystem goals and meet future mission requirements. The enhancement and/or restoration of wetlands or streams on DoD property also may be an acceptable means for mitigating mission impacts on wetlands to meeting permit conditions as required by Section 1344 of Title 33, U.S.C.

Other regulatory agencies that have jurisdiction over wetlands in Virginia include VDEQ, VMRC, and the local wetlands board. Regulatory agencies that have jurisdiction over wetlands in North Carolina include NCDEQ, and the North Carolina Division of Coastal Management, and the Agricultural Stabilization and Conservation Services. Depending on the wetlands impacted, a permit may be required from one or more of the different regulatory agencies.

4.2.3 Watershed Protection

NSAHR HQ Complex, NSAHR LRA, and NSAHR PA are all located within the Chesapeake Bay watershed, which is recognized as one of the most important and productive estuarine ecosystems in the world and is protected by federal, state, and local regulations. The Chesapeake Bay watershed is home to more than 3,600 species and more than 15 million people all in competition for resources and space within the region of 64,000 square miles (165,760 square km). The Chesapeake Bay Program (CBP) is a regional partnership that leads and directs Chesapeake Bay restoration and protection. CBP partners include federal and state agencies, local governments, nonprofit organizations, and academic institutions. The USEPA is the lead federal agency at the CBP, and DoD is an active partner in the CBP. The DoD CBP office, which is part of the DoD Regional Environmental Coordination (REC) office, is the lead office responsible for coordinating all data gathering, consolidation, and reporting of DoD activities related to Bay restoration and protection. Data is reported by this office to the Bay jurisdictions and the CBP, and information is communicated to DoD installations and senior leadership via the DoD Chesapeake Bay Action Team, quarterly journals, and an annual report. The journals and annual report are made available to the public as part of a strong public outreach component of the REC office. NSAHR HQ Complex and NSAHR PA are regulated under VDEQ MS4 Permit #VAR040143 for discharges of stormwater from small MS4s to reduce nutrient loading into the Chesapeake Bay watershed.

The Navy is a signatory to (or otherwise subject to the requirements of) a number of Chesapeake Bay agreements and rules, including the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay;* the 1998 *Federal Agencies' Chesapeake Ecosystem Unified Plan*; *Chesapeake 2000: The Renewed Bay Agreement*; the federal *Chesapeake Bay Restoration Act* of 2000 (33 U.S.C. §1267); EO 13508 *Chesapeake Bay Protection and Restoration (2009)*;

the 2010 Chesapeake Bay Total Maximum Daily Load (TMDL); the 2014 Chesapeake Bay Watershed Agreement; and the *Chesapeake Bay Accountability and Recovery Act* of 2014. These agreements and laws identify goals and commitments aimed at the preservation and restoration of the Chesapeake Bay. Major goals of the Chesapeake Bay agreements include reducing nutrients and toxins, protecting stream corridors, enhancing and protecting wetlands, protecting priority watersheds, identifying and controlling invasive species on priority sites, and expanding conservation landscaping on federal facilities.

The Chesapeake Watershed Cooperative Ecosystem Studies Unit, which includes universities, research institutions, and federal agency partners such as the DoD, promotes stewardship and integrated ecosystem management of natural and cultural resources within the Chesapeake Bay watershed through collaborative research, technical assistance, and education.

In 1998, significant portions of Chesapeake Bay and its tidal tributaries within Virginia were identified as not meeting water quality standards and listed as impaired for nitrogen, phosphorus, and sediment. The EPA published a TMDL for the Chesapeake Bay in 2010, which addresses all segments of the Bay and its tidal tributaries that are on the impaired waters list. As with all TMDLs, a maximum aggregate watershed pollutant loading necessary to achieve the Chesapeake Bay's water quality standards was identified. This aggregate watershed loading is divided among the Bay states and their major tributary basins, as well as by major source categories (wastewater, urban storm water, septic, agriculture, air deposition). Virginia submitted its Phase I Watershed Implementation Plan (WIP) in November 2010, and the EPA accepted that plan and included it in the Chesapeake Bay TMDL with minor modifications. Virginia submitted the final Phase III WIP in April 2019 and continues to work toward the required TMDL reductions setting and working towards 2-year milestones.

None of the water resources within NSAHR HQ Complex, NSAHR LRA, or NSAHR PA are identified as impaired. Portions of the Elizabeth River, which is adjacent to NSAHR HQ Complex and NSAHR PA, have been identified as impaired for estuarine bioassessments; however, all portions are considered low priority to be addressed with a plan for 2022 (VDEQ n.d.). Scott Creek, adjacent to NSAHR PA is currently listed as Category 5 impaired for estuarine bioassessments; however, it is considered a low priority to be addressed with a plan by 2022. The Lafayette River, which is adjacent to NSAHR LRA, is not currently listed as impaired.

NSAHR NWA lies in the Southern Rivers Watershed. Nonpoint source pollution is ranked high in this drainage basin, with agricultural runoff accounting for much of the pollution (Van der Leeden 1993). Basin-wide, nutrient pollution from excess fertilizer is the most significant source, followed by pesticide runoff. Erosion and sedimentation also contribute significantly to the nonpoint source pollution within this basin, and primarily as a result of agricultural practices, though land-clearing activities for development purposes are now becoming a major contributor of this type of pollution. Virginia passed legislation in 2011 (incorporated into Virginia Code) that placed restrictions on the sale and distribution of fertilizer, specifically phosphorus and nitrogen content. The effective date for phosphorus restrictions was December 2013 and the effective date for nitrogen restrictions was July 2014.

No waterbodies at NSAHR have been identified as impaired; however, impaired waterbodies have been identified within the Southern Rivers Watershed in Virginia, including the Northwest River

(at River Mile 22.15, downstream to the Virginia state line at River Mile 7.49), the lower Northwest River (from the Indian Creek confluence, downstream to River Mile 8.23, downstream of Smith Creek), middle Northwest River (from River Mile 16.63 to River Mile 10.44, from upstream area of Pine Grove Lane downstream to Indian Creek confluence), upper Northwest River (from River Mile 22.15 TO 16.63, from headwaters downstream to upstream of Pine Grove Lane), Indian Creek tributary to the Northwest River, unnamed tributary to Northwest River (from Saint Brides road crossing to confluence with Northwest River), and Mill Swamp (EPA 2014b). In North Carolina the impaired waterbodies associated with the Albemarle Watershed are associated with estuary and coastal waters, and freshwater lakes (EPA 2014a).

The Navy also supports the protection of watersheds through initiatives such as establishing or enhancing riparian forest buffers along unprotected waterways. At the Installation, development and vegetation clearing within 50 ft (15 m) of any wetland or shoreline will be minimized to the maximum extent practicable. Effective methods of establishing riparian buffers include reducing the frequency of mowing, establishing no mowing zones along wetland edges to increase vegetative filters, and planting appropriate native trees, shrubs, and ground cover vegetation. Buffers established between agricultural outlease areas and any adjacent ponds consist primarily of forested areas adjacent to the agricultural fields and early successional/emergent grass areas located adjacent to the ponds. The Navy also works with the local government, adjacent landowners, and other organizations to place conservation easements over non-Navy properties to help protect watersheds and other important natural resources within the Installation's contributing ecosystem types.

4.2.4 Stormwater Quality

Stormwater management is an important part of point source and nonpoint source pollution control; these issues are managed outside of this INRMP, under separate plans and programs. NSAHR is regulated under Naval Station Norfolk's VDEQ VPDES Permit #0004421 for regulated industrial activities and requires annual Storm Water Pollution Prevention Plan (SWP3) updates to identify and map potential pollutant sources that may contribute to the contamination of stormwater discharges from permitted industrial outfall drainage areas (Appendix H); additional stormwater management plans have also been developed, as well as a Best Management Practices (BMP) Inventory and quarterly inspections for existing stormwater management facilities and structures. These documents should be referred to directly for guidance and information on NSAHR's Stormwater Management and Pollution Prevention programs.

A VPDES Stormwater Discharge Permit for Construction Activities, however, would be required for any planned or future construction that would disturb 1 ac (0.1 ha) or more. This permit requires construction site operators to develop and implement a SWP3 that uses best management practices (BMPs) for erosion and sediment control at the construction site. The SWP3 also requires the operator to manage other wastes on site, such as building materials, garbage, and debris; to have controls to minimize the exposure of these materials to stormwater; and to minimize the discharge of pollutants to state waters. VDEQ does not specify which BMP must be implemented at a construction site. Permits for construction sites do not typically contain monitoring requirements; however, they do require regular inspections of stormwater discharges from the site to ensure that the BMPs are controlling the discharge of pollutants to the maximum extent practicable and are meeting water quality standards (VDEQ n.d.).

The North Carolina Division of Water Quality administers the NPDES in North Carolina. There are no regulated stormwater outfalls in the North Carolina portion of the Installation (Din 2004).

The Navy has adopted other practices and participates in programs designed to reduce stormwater runoff and impacts, including applying low impact development (LID) practices and participating in the Leadership in Energy and Environmental Design (LEED) program. LID is an approach to land development that works with nature to manage stormwater as close to its source as possible. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. The LEED program is a series of rating systems that encourages building owners and operators to be environmentally responsible and maximizes resource efficiency. One example of how the Navy has implemented these practices is the inclusion of a vegetated/green roof and other features that were incorporated into the Correction Facility/Brigade that was built with these initiatives in mind.

A Stormwater Prevention Plan for NSAHR HQ Complex was finalized in 2019 (Appendix H). A comprehensive survey was completed of the entire installation to identify activities onsite with the potential for stormwater pollution. The survey functioned as a screening mechanism and then a more detailed site investigation was completed for buildings/areas that may be regulated under the Virginia Pollutant Discharge Elimination System permit requirements and/or have the potential to contribute to stormwater pollution (Appendix H).

A stormwater management BMP was designed for NSAHR PA for filter strip Opportunity NSAP-FS-1 identified during the 2017 Opportunity Assessment for the Second Permit Cycle of the Chesapeake Bay Total Maximum Daily Load (Navy 2019e). The filter strip provides reductions for pollutants of concern, including total nitrogen, total phosphorous, and total suspended solids. Under existing conditions, stormwater runoff flows across Williamson Drive, across the grassy area towards the stone wall, and discharges through the stone wall into the Elizabeth River. The objective of the filter strip is to provide water quality treatment and water runoff reduction from a portion of Williamson Drive, the paved parking area, and the grassy area north of Williamson Drive. Potential sources of pollutants are associated with atmospheric deposition, vehicular traffic, erosion runoff, and urban runoff. The filter strip would reduce the export of pollutants by slowing runoff velocities and allowing runoff to infiltrate; sediment and attached pollutants to settle; and biological uptake of plants and microbial activity.

The estimated pollutant of concern reductions are estimated to be 10.04 pounds (lbs) of total nitrogen per year, 1.01 lbs of total phosphorous per year, and 289 lbs of total suspended solids per year.

More information on LID practices is available at: http://water.epa.gov/polwaste/green/.

More information on LEED program requirements is available at: http://www.usgbc.org/leed

NSAHR NWA is relatively undeveloped and has few sources of industrial pollutants. The waste-water treatment plant is the only ongoing activity in the Virginia portion of NSAHR NWA regulated under VDEQ VPDES Permit #VA0024244. The permit regulates the waste-water

treatment facility and the treated domestic wastewater effluent that discharges through regulated Outfall (OF) 001 to Mill Stream.

4.3 Law Enforcement of Natural Resources Laws and Regulations

The Sikes Act requires that CLE be provided on military lands (Benton et al. 2008), and that each military department will ensure that professionally trained NR and CLE personnel are assigned responsibility to protect and manage natural resources found on DoD installations, including implementation of INRMPs. DoD installations must coordinate with the appropriate agencies to support CLE and enforce federal and applicable state laws and regulations that pertain to the management and use of the natural resources under their jurisdiction. This has included a variety of law enforcement options including employment of civilian CLEOs/game wardens, military police, or combinations of civilian CLEOs and military police. According to DoD Instruction 5525.17 (DoD 2020), it is DoD policy that CLEOs assigned to DoD law enforcement elements may be co-located with the conservation program manager at the installation. In addition, CLE rules and responsibilities must be integrated into an installation's INRMP and Integrated Cultural Resources Management Plan (ICRMP), where CLE is required. The Navy is currently working to determine a way forward with the CLE.

No Conservation Law Enforcement Program Needs Assessments have been published for NSAHR HQ Complex, NSAHR LRA, or NSAHR PA.

A Conservation Law Enforcement Program Needs Assessment was published in 2016 and identified policies and provided direction for the CLEP (Navy 2016). The assessment applied to NSAHR NWA, as well as NASO, NASO-Dam Neck Annex, and Naval Auxiliary Landing Field Fentress (NALFF). The purpose of the CLEP is to ensure the enforcement of federal conservation statutes set forth in DoD Instruction 5525.17 and applicable state and installation laws, and to protect sensitive natural and cultural resources in order to sustain use of military lands for readiness activities. The CLEOs conduct a range of complex law enforcement activities to enforce natural and cultural resources laws, including but not limited to the following: conducting field checks of individuals; investigating fish and wildlife crimes; patrolling; surveillance; interviewing witnesses; interrogating suspects; searching for physical evidence and clues; seizing wildlife or archaeological contraband, equipment, and vehicles; searching and serving warrants; making arrests; and testifying in federal and when authorized, state courts, for violations of any of the federal conservation laws provided in DoD Instruction 5525.17, state and installation laws, and other applicable laws not listed in this instruction.

The objectives of the CLEP in accordance with DoD Instruction 5525.17 are to:

- Conserve and direct the use of natural and cultural resources in accordance with the INRMP and ICRMP.
- Ensure installations and military and public users remain in compliance with appropriate environmental, natural, and cultural resource laws and regulations.
- Provide specialized law enforcement expertise regarding natural and cultural resource matters and protection of government property.

- Improve inter-jurisdictional conservation law enforcement among the military departments, federal, state, tribal, and local law enforcement and land management agencies.
- Collect and track data on violations.

Because the Navy has not yet provided a formal instruction or regional CLEP that identifies CLEO training requirements and specific CLEP obligations, the development of such a document is recommended in order to define and clarify the roles and responsibilities for CLE at regional installations, and for incorporation into INRMPs/ICRMPs as directed by DODI 5525.17 (Navy 2020).

4.4 Fish and Wildlife Management

The diverse ecological communities of NSAHR support a variety of wildlife including game and nongame species. An important function of the NRP is to maintain and enhance habitats that support a full spectrum of native wildlife species, including mammals, birds, herpetofauna, fish, and invertebrates. The basic objectives of fish and wildlife management at NSAHR are to:

- 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 federally listed rare, threatened, or endangered species;
- maintain and enhance habitat for resident and migratory bird species;
- balance wildlife population levels within habitat carrying capacity; and
- provide recreational opportunities for Installation personnel and their dependents, and community members.

Employing an ecosystem approach to wildlife management helps ensure that the needs of a full range of native regional wildlife species are satisfied rather than those of a single or few select species (see Section 4.20). Common wildlife management tools available to natural resources managers include habitat management, and when appropriate, population management.

Climate change-induced sea-level rise has the potential to affect existing fish and wildlife resources by impacting migratory patterns, species distribution, and habitat availability at a regional level. Management strategies for adapting to and mitigating the effects of these changes have been explored in a publication titled *Virginia's Climate Modeling and Species Vulnerability Assessment: How Climate Data Can Inform Management and Conservation* (National Wildlife Federation 2013)*;* management recommendations developed by this project will be incorporated into this INRMP as appropriate. The most recent SWAPs also include specific management recommendations for sensitive species that may be venerable to climate change (VDGIF 2015a, NCWRC 2015).

4.4.1 Population Management

Population management generally entails controlled harvest or stocking of select game species. White-tailed deer are the primary species actively controlled through population management. White-tailed deer is a generalist species that occupies nearly every habitat type at NSAHR. Deer utilize forested areas for cover throughout much of the day; then, in the early mornings and evenings when they most actively feed, they typically utilize agricultural lands, mowed roadsides, open fields, and the residential portions of the Installation. 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 and North Carolina. In areas with particularly high densities, deer can degrade natural ecosystems by inhibiting regeneration of native species, thereby restricting natural diversity. Deer-vehicle collisions, damage to ornamental plantings, crop damage, and other problems also increase as deer populations exceed carrying capacity. There are no hunting programs at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. The deer population at NSAHR NWA is controlled through a regulated hunting program and NSAHR Instruction 5090.5 (Appendix I). Deer harvest data and hunt areas and deer stands maps for NSAHR NWA are available in Appendix I. The Virginia Department of Game and Inland Fisheries Virginia Deer Management Plan describes the history of white-tailed deer management, current status of the deer resource and management programs, and the future of the deer management program in Virginia (VDGIF 2015b).

Prior to conducting any other native species population management, an assessment of those species and their utilization of the Installation and their contribution to non-Installation lands (ecosystems) must be conducted before the implementation of population control actions (e.g., recreational hunting of bear or turkey). Established nuisance wildlife pest, and invasive species population management (e.g., nutria, beaver, feral hog [*Sus scrofa*], feral cat [*Felis catus*], European house sparrow, coyote, red imported fire ant [*Solenopsis invicta*]) is conducted on the Installation in addition to deer population management.

4.4.2 Habitat Management

The diversity of habitats including mature forested wetlands and upland hardwood forests, early and late successional pine stands, fields and scrub-shrub habitat, and agricultural lands at the NSAHR fulfills the habitat requirements for many regional wildlife and migratory bird species. Wildlife management goals at NSAHR are best realized through maintaining this diversity of ecological communities and enhancing habitat value where practicable. Pollinators, forestry, agricultural, and other land management practices that enhance habitat value for wildlife are discussed in the following paragraphs. Habitat and conservation efforts at NSAHR also should account for projected impacts from climate change, as described in Section 3.2, which could result in altered habitat, especially along the coast.

4.4.2.1 Pollinators

The Navy recognizing the important ecological role played by pollinators, has encouraged installations to foster pollinator habitats. As a group, pollinators are threatened worldwide by habitat loss and fragmentation, pesticides, disease, and parasites (USDA NRCS n.d.). According to the USDA NRCS, native pollinators are attracted to diverse, colorful floral sources that provide a succession of flowers. Providing flowers of different shapes and sizes will attract pollinators with

different body sizes and mouthparts. Use of native plants is preferable since these are usually adapted to Virginia's and North Carolina's growing conditions and native pollinators have evolved with these plants.

More information on improving habitat development for pollinators, including recommended plant species for the Mid-Atlantic Region, is available at https://www.xerces.org/publications/guidelines/mid-atlantic-native-meadows.

The USFWS published the *Guidelines for Coordination on Integrated Natural Resource Management Plans* in 2015 (USFWS 2015) and added the addendum: *Addressing Pollinator Conservation in INRMPs* in 2018. The addendum provides a checklist with key items that address pollinator management on installations; the items are provided as recommendations and to encourage discussion and are not required to be implemented. The key items include:

- Endangered/threatened pollinators, pollinators designated Birds of Conservation Concern, and monarch butterflies;
- General habitat management;
- Pest Management;
- Outreach;
- Partnerships; and
- Land management (grounds maintenance, recreation areas, forest management, prescribed fires).

4.4.2.2 Forestry

Forest management practices that create complex stands with high species and structural diversity are most consistent with wildlife management objectives and will be employed wherever possible to achieve forest and wildlife management objectives. In NSAHR's forested areas, wildlife habitat value is generally lowest in dense, closed canopy pine stands. Food and cover availability are very low and is limiting to most bird and wildlife species. Thinning and/or maintaining pine stands that have reached canopy closure (over 15 ft [5 m] in height) with prescribed fire can reduce dense growth and release understory annuals and perennials that improve wildlife habitat value. Winter burns are used in order to maintain a hardwood component in the stands and allow for mast production.

When timber harvesting occurs, snags are retained in the harvested units to provide habitat for cavity-nesting birds and mammals. Dead and down woody material that mimics old-growth characteristics and provides important habitat for small mammals, reptiles, and amphibians also will be left in place.

NSAHR's forested wetlands, specifically those at NSAHR NWA, are particularly important habitat for several migratory birds including multiple species of warblers (see Tables 2-8 and 2-9). Timber harvesting in forested wetlands is handled on a case-by-case basis to continue to provide habitat for these and other wildlife species.

4.4.2.3 Agricultural Areas

Agricultural fields typically offer limited wildlife potential because of their large size and lack of diversity. Current program initiatives that improve wildlife habitat in agricultural parcels include encouraging the use of conservation farming practices such as no-till and row-crop rotation systems. These management procedures are implemented in accordance with Soil and Water Conservation Plans that accompany each agricultural outlease agreement. Establishing permanent hedgerows, reducing mowing on expanded buffer strips, and leaving designated strips of cropland unharvested are other actions that could be taken to improve wildlife cover and food availability for northern bobwhite, eastern cottontail, and a variety of grassland birds.

Agricultural lessees are expected to factor in a 10% crop loss due to wildlife damage/browsing. When crop loss is proven to exceed the 10% crop loss threshold, additional population control measures can be implemented by the NRP to minimize the threat of crop loss.

4.4.2.4 Operational Areas

The use of prescribed fire is also a beneficial management practice used in operational areas, where it promotes the establishment of native grass and forb species and reduces mowing costs. Cane thickets and scrub shrub habitat are particularly important habitats that support a number of bird and wildlife species. To maintain different stages of early successional habitat and ensure the continuous availability of escape and nesting cover, no more than one-third of early successional habitat acreage should be treated annually. Avoiding burning, mowing, or otherwise disturbing nests during the breeding season, which occurs roughly mid-April through late July, is important for successful nesting of many bird species.

4.4.2.5 Wildlife Food Plots

Planting and maintaining wildlife food plots is a practice that provides food and cover during times of the year when these resources are scarce for a number of wildlife species. Although food plots are not costly, they require labor that is not currently available in the NRP and this management technique is not generally practiced at NSAHR.

4.4.2.6 White-tailed Deer Management

NSAHR participates in the VDWR and NCWRC voluntary Deer Management Assistance Programs (DMAP). DMAP is a site-specific management program that allows for more liberal harvests of antlerless deer to better manage the deer population. The DMAP tags may only be used to harvest male fawns and does. Deer management objectives such as stabilizing, reducing or increasing populations are adjusted per county based on annual harvest data. Annual hunting seasons and bag limits are set to help achieve management objectives (VDGIF 2015b).

Basic deer harvest data collected by the DMAP include sex, deer weight (live or dressed), lactation status of females, number of points on males, antler measurements, age, and hoof condition (used as an indicator of disease). Other useful data includes hunter density (hunter person-days), permit types, number of roadkill, and season (fall and winter bow hunting, and muzzleloader). Jaw bones are collected to accurately age the deer at a later time. No deer harvest occurs at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Deer harvest data collected at NSAHR NWA are maintained by NR staff and submitted to each state annually (Appendix I). The states summarize

the data and provide annual reports to NSAHR. Data provided in the annual reports provide information on population trends and herd condition, which are used to assess success in meeting management objectives. Because deer harvests vary from year-to-year according to weather, food availability, or fluctuations in herd size, 3–5 years of harvest data are needed for a meaningful harvest analysis.

4.4.3 Fisheries Management

The NSAHR 5090.4 Instruction (Appendix H) directs Virginia state fishing procedures and regulations for fishing at NSAHR PA, and NSAHR NWA. Three recreational fishing ponds (Bass Pond and Catfish Pond 1 and Catfish Pond 2) were excavated during the 1960s at NSAHR NWA, the Bass Pond is not currently a managed recreational fishing site, and the site has become overgrown and naturalized with vegetation. It has been determined that restoration of this pond would have more negative natural resources impacts than positive impacts. All recreational fishing opportunities identified for the future should focus on Catfish Ponds 1 and 2, Mill Stream, and Lunker Lake. Past fisheries assessments of Lunker Lake suggested that the pond is too small, steep-sided, and lacks shallow spawning grounds needed to support a self-sustaining, balanced fish population and that extensive reconstruction would be required to establish a fishing program (USFWS 1987); however, NSAHR Instruction 5090.4 directs catch and release at Lunker Lake. The reconstruction of Catfish Ponds 1 and 2 resulted in the current design of what is now commonly called Lunker Lake, which also is used as an emergency fire truck water recharging site (when water levels are sufficient). Recommended modifications included reconstructing the slopes at a 3:1 slope, removing the dam between Lunker Lake and the small adjacent pond to provide spawning habitat, and considering a future liming and fertilization program after the structural problems are corrected.

A recreational fisheries assessment of Lunker Lake and Mill Stream at NSAHR NWA was completed in 2013 in order to assess the current condition of Lunker Lake and Mill Stream. For Lunker Lake, the assessment included the description of existing fish populations (using data collected by the VDWR), water quality, shoreline accessibility, aquatic and shoreline vegetation, parking availability, as well as identifying the potential for fish stocking, pier location, boat ramp placement, and fish habitat improvements. For Mill Stream, the assessment included evaluating the current suitability of habitat (e.g., fish passage) and the potential for enhancements to habitat accessibility, such as removing obstructions to flow and passage to improve access for migratory species, especially river herring (*Alosa* spp.), and American eel.

A total of 32 fish, represented by five species, were collected from Lunker Lake. All individuals were positively identified at the species level in the field. No deformities, lesions, or abnormalities were observed in any of the specimens collected. Largemouth bass was the most abundant species, representing 43.8 percent of the total catch, followed by bluegill at 37.5 percent, and American eel at 12.5 percent. The frequency of occurrence for each species was different than observed in previous surveys within Lunker Lake, but the overall length distributions for most species were similar to previous surveys. For Mill Stream, a total of 12 potential barriers for fish migration were identified: four bridges, five debris dams, and three culverts. A total of 43 fishes, represented by 11 species, were collected from two stream reaches.

The assessment identified several potential issues that may arise if Lunker Lake is used for recreational fishing including the spread of invasive aquatic species, nutrient loading and impacts to water quality, and fish kills and disease. Management recommendations for the potential development of a recreational fishing program at Lunker Lake are provided, as well as improvements to Mill Stream to improve passage potential for migratory fish (Navy 2014b).

4.4.4 Nest Box/Platform Program

No artificial nest boxes have been used at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Installation of nest boxes has been used at NSAHR NWA to enhance habitat conditions and nesting capability for wildlife. These structures are particularly beneficial in areas where there are few natural cavity trees or where competition from aggressive nonnative species such as house sparrows and European starlings (*Sturnus vulgaris*) is higher. Placement of structures that benefit insectivorous birds in urban and housing areas also provides a benefit to people as these birds can consume thousands of insects a day. Eastern bluebirds, tree swallows (*Tachycineta bicolor*), purple martins (*Progne subis*), eastern phoebes (*Sayornis phoebe*), American kestrels (*Falco sparverius*) and bats are species that commonly utilize artificial structures; however, the Nest Box Program could potentially be expanded to benefit other species. Nest box construction and placement should consider the availability of appropriate habitat and structural requirements for target species. Important considerations in nest box construction are competition from European starlings and house sparrows (*Passer domesticus*) and predation by raccoons (*Procyon lotor*) and cats.

With the support of volunteers, NR staff have constructed and installed approximately 62 eastern bluebird (*Sialia sialis*) boxes, 15 American kestrel boxes and several additional purple martin (*Progne subis*) houses, wood duck (*Aix sponsa*) boxes, and bat boxes at NSAHR NWA. Due to labor limitations, these structures are not currently being cleaned or maintained routinely by NR staff or volunteers.

Habitat requirements, natural history, and nest box specifications for these and other species are on the Cornell Lab of Ornithology website: http://nestwatch.org/

In the summer of 2008, an attempt to inventory these nest boxes and assess structural conditions was conducted by students assisting with implementation of the program. The students were able to locate many of the structures, but several were not located. In 2013, a local chapter of the Boy Scouts of America inquired into supporting this program, and the NSAHR NWA NRP expressed interest in supporting this partnership. Current GIS data is available for bluebird boxes only (Figure 4-1) and will soon be available for kestrel boxes.

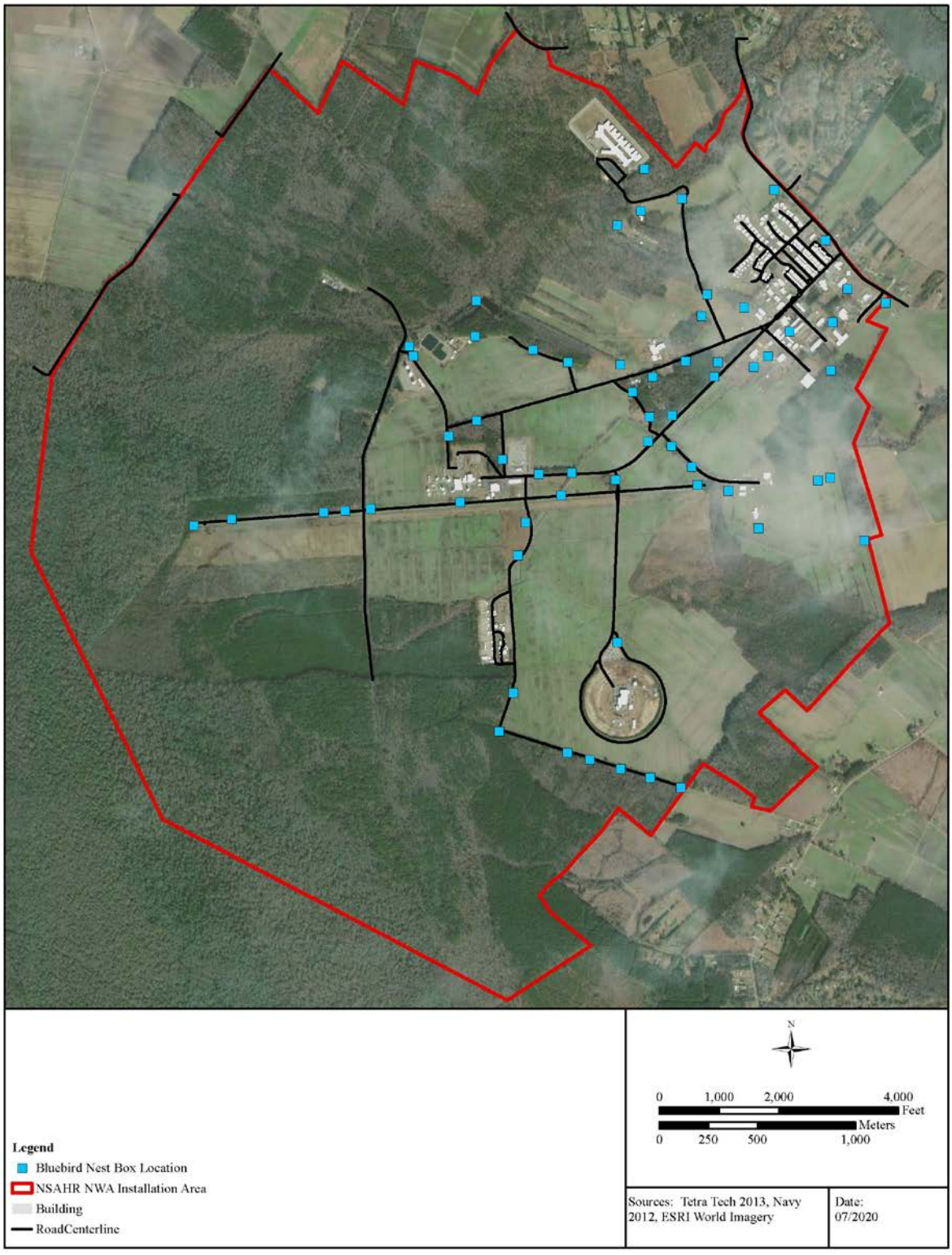

Figure 4-1. Bluebird Nest Box Locations of NSAHR NWA.

4.4.5 General Fish and Wildlife Management

In 2000 Congress began to provide annual funding to supplement existing state fish and wildlife conservation programs. Along with this funding came the responsibility of each state and territory to develop a Comprehensive Wildlife Conservation Strategy—an Action Plan for wildlife—by 01 October 2005.

Natural resources management strategies and recommendations included in this INRMP also satisfy the goals and objectives of the Virginia and North Carolina State Wildlife Action Plans (SWAPs) in conserving the state's natural resources for future generations.

4.4.5.1 Virginia State Wildlife Action Plan

The Virginia SWAP was adopted in 2005 and updated in 2015. This SWAP includes an evaluation of the location and relative abundance of wildlife and the habitat required to support these species, an assessment of problems facing Virginia species and habitats, recommended conservation actions to address these problems, research and survey needs, and monitoring program and needs. These species are further grouped three Conservation Opportunity Ranks: A, B, or C (VDGIF 2015a, see Section 3.8 State Comprehensive Wildlife Plans).

The SWAP identifies the species of greatest conservation need for each ecoregion of Virginia, and provides life history, location and relative condition of habitat, specific threats and trends, conservation actions and strategies, and research and monitoring needs for each species (VDGIF 2015a). NSAHR is located within the Hampton Roads Planning Region and a list of fish and wildlife species identified as Species of Greatest Conservation Need is available in Appendix F.

The Virginia SWAP contains a list of Species of Greatest Conservation Need for the Mid-Atlantic Coastal Plain region of Virginia, and is available for viewing and downloading at:

http://bewildvirginia.org/wildlife-action-plan/

Natural resources management strategies and recommendations included in this INRMP also satisfy the goals and objectives of the Virginia SWAP in conserving the state's natural resources for future generations.

4.4.5.2 North Carolina State Wildlife Action Plan

The North Carolina SWAP was developed by the NCWRC in 2005 and updated in 2015. The SWAP identifies 129 priority wildlife species that are targeted for conservation action within North Carolina. A list of protected wildlife species in North Carolina is included in Appendix F.

The North Carolina SWAP identifies priority species associated with various habitats within the Mid-Atlantic Coastal Plain region of North Carolina, and is available for viewing and downloading at: http://www.ncwildlife.org/plan.

4.5 Forestry Management

Forest resources at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA are minimal since these properties are developed, although very small corridors of forest can be found on the northwest and east portions of NSAHR HQ Complex. The forest resources at NSAHR NWA are extensive, with forests covering approximately two-thirds (2,345 ac [949 ha]) of the Installation. Forest management objectives are broad and include sustaining healthy, forested ecosystems while supporting the military mission and providing for a range of social, economic, and environmental benefits. A copy of the 2019 Forest Management Plan for NSAHR NWA can be found in Appendix J. The plan provides:

- a brief overview of forest composition and changes from earlier inventories,
- forest management objectives and strategies designed to meet Navy mission and stewardship requirements and fulfill management objectives specified in the installation INRMP,
- stand prescriptions and treatment schedule for an approximate 10-year time period, and
- potential long-term forest management prescriptions based on current forest conditions and management objectives for each of the installation's 90 forest stands.

The harvest and regeneration of timber; maintenance of biodiversity and ecosystem integrity; watershed protection; fish and wildlife management; rare, threatened, and endangered species protection; and outdoor recreation are all suitable uses for forested areas at NSAHR NWA. Converting hardwood-dominated and mixed stands to pine monocultures, however, is not consistent with the principles of ecosystem management or Navy policy and will be avoided. Since Navy acquisition, forest management has been generally focused on timber stand improvement and regeneration of the managed pine stands. Management has been largely custodial in the hardwood-dominated stands and the Installation's vast area of forested wetlands.

In September 2003, Hurricane Isabel struck southeast Virginia causing widespread damage to the area, including approximately 300 ac (121 ha) of the Installation's forest habitat (Petersen 2004). Hurricane damage was heaviest in the northern portion of the Installation and was particularly damaging to the Installation's mature hardwood stands. It is estimated that nearly 70% of forest habitat loss occurred in mature hardwoods, 20% occurred in mixed stands, and 10% occurred in mature pines. Typically, Nor'easters and ice storms cause the most physical damage to forest resources in the region. On occasion, such as in 2003, the Installation is subject to hurricane-force winds that damage and impact forest resources. Storm damage is a natural event creating the vegetation community and structure changes needed to maintain species diversity. Management of storm damaged locations is dependent on multiple factors, including but not limited to, management of species of concern and disease, timber value assessments, human health and safety, and military training objectives. Selective harvesting of storm damaged timber will be reviewed and coordinated on a case-by-case basis and coordinated through the Installation NRM and regional forestry program NRM.

The loss of mature hardwood is of particular concern because of the level of dependence timber (canebrake) rattlesnakes Coastal Plain population have on this habitat type. Natural restoration of hurricane-damaged areas has occurred. A new inventory of these areas was completed in 2014 (CH2MHill and Spatial Informatics Group 2015) and is discussed in Section 4.5.1 Forest Inventory.

A large portion of the NSAHR NWA forest management program involves maintaining military mission vegetation height requirements as part of the Installation's Timber Harvesting Program. At NSAHR NWA the ROTHR program prepared a 2013 Clear Zone Management Plan (CZMP) to meet their mission requirements. A finalized EA covering the ROTHR's clearing requirements was initialized prior to the completion of this plan (NSAHR NWA 2006).

The Proposed Action covered by the EA involved silvicultural harvesting of approximately 293 ac of trees and other vegetation within the ROTHR receiver clearance angle zone. The purpose of the Proposed Action was to maximize the ROTHR operational capabilities by clearing trees and other vegetation at three areas that impaired the operation of the ROTHR system (NSAHR NWA 2006). The alternatives of the Proposed Action included 1) harvest and management for pine monoculture regrowth (pine monoculture), 2) phased harvest, 3) harvest and management for multiple purposes (multiple purposes), and 4) no action. A summary analysis of the projected environmental impacts for the Proposed Action can be found in Table 4-1. The EA concluded that neither the No Action Alternative nor the action alternatives would have a significant impact on any environmental resources, individually or cumulatively. To date, six clearing projects have been completed under the 2006 EA (NSAHR NWA 2006). Tree clearing activities may require Section 7 consultation with USFWS for potential impacts to northern long-eared bat. For more information see https://www.fws.gov/northeast/virginiafield/endangered/projectreview_step3b.html

4.5.1 Forest Inventory

Forest health and productivity are largely assessed by information gathered during periodic forest inventories. No forest inventories have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA since the land at these properties is highly developed.

During the winter of 1997 and spring of 1998, a forest inventory was conducted at NSAHR NWA (Navy 1998b). A forest inventory for NSAHR NWA was completed in 2014 and is discussed in this section. The update to the forest inventory provides additional information on stands affected by the 2003 hurricane and other storms/natural events and military land use changes, as well as changes in stocking and growth that have occurred since the previous inventory.

The second forest inventory performed in 2014 re-visited all stands delineated in the 1997-1998 forest inventory. The survey report noted that as discussed in the 1997-1998 inventory report, many of the forest stands at NWA originated through natural colonization of abandoned agricultural fields by pioneer species such as loblolly pine and to a lesser degree through direct planting. The 1997-1998 forest inventory report noted that much of the forest resource was already transitioning to hardwood from the early domination by loblolly pine. In the absence of forest management activity or natural disturbances, this transition is expected as species more tolerant of shade than loblolly pine become established in the understory and gradually increase in volume and importance in the stands.

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Table 4-1. Alternatives Comparison–Summary of Projected Environmental Impacts.

Environmental Resource	No-Action Alternative	Pine Monoculture Alternative	Phased Harvest Alternative	Multiple Purposes Alternative
Geology, Topography, and Soils	No current adverse impacts to geology, topography, and soils.	Short-term adverse soil impacts during timber harvesting activities (use of mechanized equipment, vegetation removal). No long-term adverse impacts.	Short-term adverse soil impacts during timber harvesting activities (use of mechanized equipment, vegetation removal). No long-term adverse impacts.	Short-term adverse soil impacts during timber harvesting activities (use of mechanized equipment and vegetation removal). No long-term adverse impacts.
Water Resources	No current adverse impacts to water resources.	Short-term adverse impacts to surface water from increased runoff. Slight increase in herbicide and pesticide runoff from pine establishment and maintenance practices. Adverse impacts to wetlands due to disturbance from mechanized equipment and increased runoff could be avoided or reduced by use of forestry BMPs. No long-term adverse impacts would occur.	Short-term adverse impacts to surface water would occur from increased runoff. Adverse impacts to wetlands due to disturbance from mechanized equipment and increased runoff could be avoided or reduced by use of forestry BMPs. No long-term adverse impacts would occur.	Short-term adverse impacts to surface water would occur from increased runoff. Adverse impacts to wetlands due to disturbance from mechanized equipment and increased runoff could be avoided by the use of forestry BMPs. No long-term adverse impacts would occur.
Biological Resources (Vegetation, Wildlife, and Rare, Threatened and Endangered (RT&E) Species)	No current adverse impacts to biological resources.	Short-term adverse impacts to vegetation would occur from clearcutting. Long-term adverse impacts from hardwood stand conversion to pine monocultures due to loss of habitat. Short-term adverse impacts to terrestrial wildlife species from habitat disturbance. Impacts to the canebrake rattlesnake (state listed endangered) could be mitigated by removal of individuals prior to timber harvest but long-term adverse impacts would occur due to conversion of preferred habitat to pine monoculture.	Short-term adverse impacts to vegetation from phased clearing; no long-term adverse impacts. Short-term adverse wildlife impacts during harvest due to habitat disturbance. Impacts to the canebrake rattlesnake (state listed endangered) could be mitigated by removal of individuals prior to timber harvest and by preservation of its preferred habitat of deep forest stands and edges of clearings.	Short-term adverse impacts to vegetation would occur from the forest clearing but no long-term adverse impacts would be expected due to the silviculture practices. Short-term adverse impacts to wildlife during harvest from habitat disturbance. Impacts to the canebrake rattlesnake (state listed endangered) could be avoided by removal of individuals prior to timber harvest and by preservation of its preferred habitat of deep forest stands and edges of clearings. Long-term beneficial effects to some wildlife due to habitat improvement practices.
Air Quality	No current adverse impacts to air quality.	Short-term adverse impacts during harvest and replanting from the emissions of motorized equipment and the generation of fugitive dust. No long-term adverse impacts would occur.	Short-term adverse impacts would occur over a longer time period due to phasing. No long-term adverse impacts.	Short-term adverse impacts during harvest activity from the emissions of motorized equipment and the generation of fugitive dust. No long-term adverse impacts.
Noise	No current adverse impacts to noise.	Short-term noise impacts during harvest but in the absence of sensitive human receptors, no adverse impacts. No long-term noise impacts.	Short-term noise impacts during phased harvest activities but in the absence of sensitive human receptors, no adverse impacts. No long-term adverse impacts.	Short-term noise impacts during harvest but in the absence of sensitive human receptors, no adverse impacts. No long-term adverse impacts would occur.
Human Health and Safety	No current adverse impacts to human health and safety.	No adverse impacts to human health and safety.	No adverse impacts to human health and safety.	No adverse impacts to human health and safety.
Cultural Resources	No current impacts to cultural resources.	No adverse impacts to cultural resources.	No adverse impacts to cultural resources.	No adverse impacts to cultural resources.
Land Use	No current impacts to land use.	No changes in or adverse impacts to land use.	No changes in or adverse impacts to land use.	No changes in or adverse impacts to land use.
Socioeconomic Resources	No current impacts to socioeconomic resources.	Small beneficial impact to the local forest industry and economy as a result of the economic activity generated by the timber harvest. However, no measurable impact to the overall regional economy because of the relatively small scale of the economic activity.	The small beneficial impact to the local forest industry and economy would occur over the phasing of the harvests. No measurable impact to the overall regional economy due to the relatively small scale of the economic activity.	A small beneficial impact to the local forest industry as a result of the economic activity generated by the harvest. However, no measurable impact to the overall regional economy due to the relatively small scale of the economic activity.

Source: NSAHR NWA 2006

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These species include oaks, sweetgum, and, to some degree, red maple. Figure 4-2 and Table 4-2 show the 2014 forest cover type distribution in terms of acreage and as a percent of total acreage. NSAHR NWA stands have continued a transition to a greater component of hardwood mixed with loblolly pine. In 2014, only 10 percent of the acreage has a pure loblolly pine composition and 63 percent of the acreage is hardwood dominated. NSAHR NWA also has a significant component of woodland dominated by natural bald cypress swamps (CH2MHill and Spatial Informatics Group 2015).

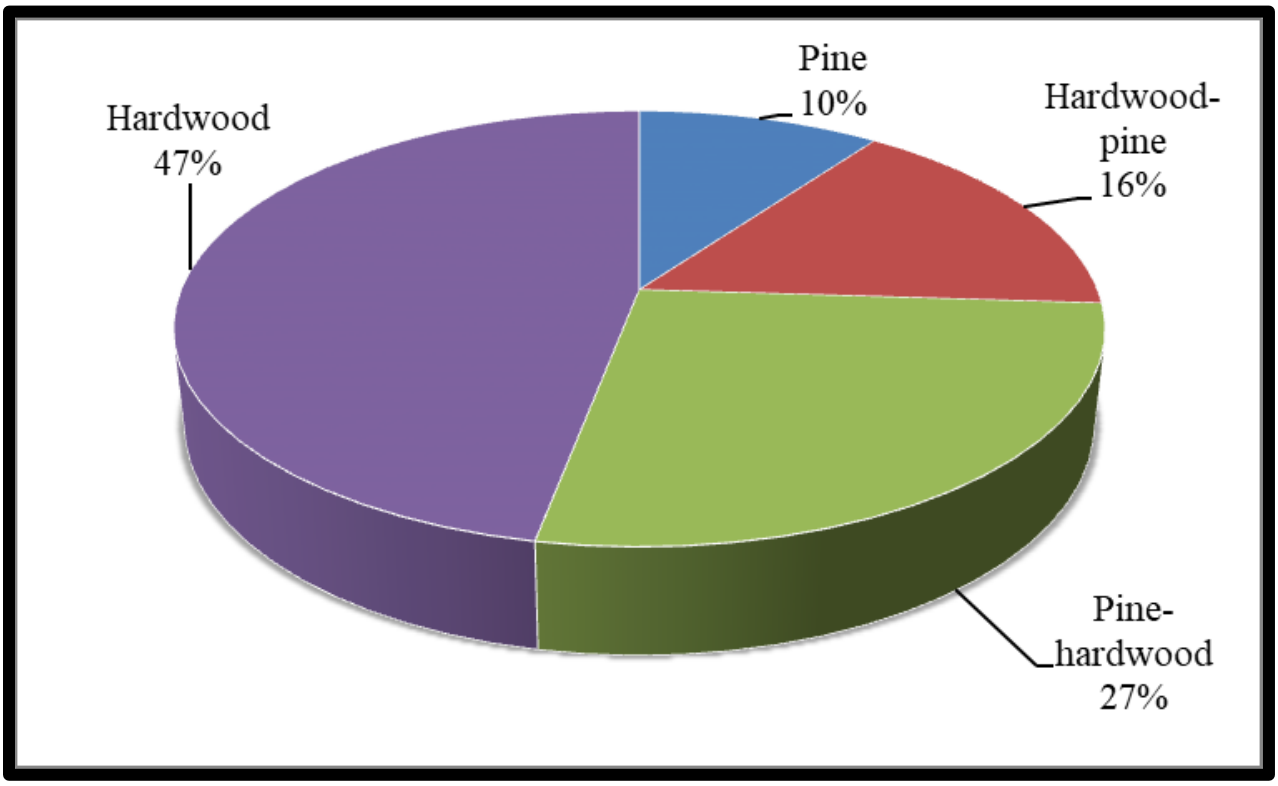

Figure 4-2. Forest Cover Types (2014) of NSAHR NWA.

Table 4-2. NSAHR NWA Forest Type Summary of Inventoried Forest Acres.

Forest Type	Acres	Percent of Total Area
Hardwood	930	47
Hardwood - Pine	315	16
Pine	204	10
Pine - Hardwood	540	27
Total	1,989	100

Source: CH2MHill and Spatial Informatics Group 2015

4.5.2 Silvicultural Prescriptions

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 NSAHR. 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 from 10–70% depending on site requirements for regeneration of the desired species, 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 also is 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 10–70% depending on site requirements for regeneration of the desired species. Retention trees should be kept through the subsequent rotation to develop old-growth characteristics. Silvicultural systems for management are not implemented at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA since the land at these properties is highly developed. Silvicultural systems for management of the major forest types found at NSAHR NWA are discussed in the following paragraphs.

4.5.2.1 Loblolly Pine

Clear-cutting and planting is the most commonly used method of regeneration in commercial pine plantations. In this system, one-year-old bare-root or container stock is planted at a rate of 400–600 seedlings per ac (0.4 ha). The lower densities allow for increased forage and cover vegetation to grow, provide better wildlife habitat, and allow for mowing and mechanical maintenance between rows. Natural regeneration methods also can produce good results in loblolly pine without the initial expenses involved in planting. 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. In clear-cuts that rely on natural regeneration from adjacent stands, the cut should not exceed 400 ft (122 m) in width. In a seed tree system, 8–10 well-formed seed trees, with diameters of 12 in (30 cm) or greater per ac (0.4 ha) are required to establish adequate regeneration. In a shelterwood harvest, about 30 seed trees per ac should be left after harvests to provide a seed source and retard growth of competing hardwoods. Seed trees may be left throughout the entire rotation to provide structural diversity to the stand. 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, as is the case throughout much of NSAHR NWA.

Stand thinning is an important management practice in managed pine stands. Even in planted stands, some amount of natural regeneration is likely to occur from adjacent pine stands, resulting in overstocking. Though stocking tables show somewhat higher volumes as being acceptable, practical experience shows that basal areas greater than 120 ft^2 (11 m^2) per ac (0.4 ha) in pine stands may be considered overstocked. During the stand rotation, maintaining a basal area of 60–80 ft^2 (6–7 m^2) per ac (0.4 ha) for poletimber and 80–100 ft^2 (7–9 m^2) 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– 50% should be preserved to the maximum extent possible during stand thinning operations. 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 southern pine beetle (*Dendroctonus frontalis*) and other pests and diseases.

Controlling competition from hardwood species is another important silvicultural practice in stands that are managed intensively for pine. Sweetgum has similar site preferences as loblolly pine and is the biggest hardwood competitor at NSAHR NWA. Prescribed burning is a commonly used method of controlling hardwoods. Once pine saplings are over 15 ft (5 m) tall, two to three late summer or winter burns conducted on a three to five year interval 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 reasons.

4.5.2.2 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 (fleshy fruits, nuts, and acorns) and forage that are necessary for 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 pine. 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 that would reduce competition and ensure oak regeneration include prescribed burns and selectively thinning the undesirable species. However, once oaks are established, the sweetgum naturally differentiates into a lower stratum that provides the lateral shading necessary for oaks to develop high quality, branch-free boles.

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 reproduction is necessary prior to harvest. If advanced regeneration is inadequate, the release of several prime seed trees per ac (0.4 ha) may be necessary.

4.5.2.3 Hardwood

Hardwood reproduction on forested sites is best accomplished through natural regeneration (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 ac (0.4 ha) 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 ft (30 m) on a side to minimize rodent damage. Harvesting in 2-ac (1-ha) units should be used to release advanced regeneration and/or stump sprouts. Intermediate thinnings may be conducted to favor the oak component.

Hardwood establishment for site restoration purposes generally 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 0.38 in (0.95 cm) is recommended. The most consistent success in hardwood planting has been through the use of tree shelters, stakes, and grass mats. Four-ft (1.2-m) tree shelters must be installed at least 1.0 in (2.5 cm) below the ground surface and tied securely to a 1-in-by-1-in (3-cm-by-3-cm) hardwood stake. Bamboo stakes may be used but must be at least 0.75-in (1.91-cm) diameter at the small end.

4.5.2.4 Atlantic White Cedar

During the 1998 forest inventory, remnant stands of Atlantic white cedar were identified on three forest stands (Stands 32, 38, and 50). The cedar was interspersed with maple, black gum, and small amounts of pine. Two additional sites were planted with cedar in 1996 as part of a study to evaluate the feasibility of using cedar for wetland restoration and enhancement (Navy 2000). One site is in an abandoned agricultural field at the USCG facility where 257 seedlings were planted. Seedling survivorship and growth at this site were excellent and the seedlings were documented to be over 15 ft (5 m) tall in 2000. Competition from invading loblolly pines, sweetgum, and other hardwoods; however, is threatening their continued survival. The second cedar site was a 12-year-old maple-gum sapling swamp near the ROTHR antenna. Approximately 520 rooted cuttings were planted; however, survivorship was less than 3%. The results of this study suggested that Atlantic white cedar can be used by the Navy for development of wetland mitigation or enhancement sites. The sites however must be chosen carefully to ensure survival of the planted Atlantic white cedar. The potential for failure is high due to numerous environmental factors. Results suggest that Atlantic white cedar grows readily in well-drained, recently abandoned agricultural fields where competition from woody species will be kept at a minimum and risk of flooding is negligible. Site success seems to be mostly influenced by excessive flooding and competition. Moderately drained, abandoned agricultural fields could be potential sites for future Atlantic white cedar plantings. The limited preparation required in these sites reduces the cost of planting significantly. These sites did not have the same hydrologic and soil conditions associated with naturally regenerated Atlantic white cedar swamps. There are several benefits to planting Atlantic white cedar in these areas. In addition, such stands could provide the Navy with a specialty wood forest product in the years to come. Such sites will also allow for natural seeding of areas that were Atlantic white cedar swamps in the past (Navy 2000).

4.5.3 Insect and Disease Control in Forest Stands

Through a Memorandum of Agreement on Forest Pest Suppression on DoD Lands, the U.S. Forest Service 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, NR personnel coordinate with the U.S Forest Service to monitor pest populations and forest conditions. The most significant forest insect and disease problems that could affect NSAHR forests, particularly within NSAHR NWA, and their silvicultural treatments are described below.

4.5.3.1 Southern Pine Beetle

Southern pine beetle is a major forest insect pest problem of loblolly pine on NSAHR NWA. 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 ft^2 (11 m^2) per ac (0.4 ha) 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 1–2 months and eventually falls as the tree dies.

Proper management of forest resources to avoid southern pine beetle infestations includes avoiding establishment of single-aged stands; and avoiding thinning, especially during drought years, which occur on average every 6-10 years, as this can weaken the defense system of the stand. The prompt salvage removal and utilization of infested trees, including salvage removal of a 40-ft (12-m) buffer strip of uninfested (green) trees surrounding the infested tree, is the best method of preventing additional tree loss. If trees cannot be salvaged, piling and burning, or cutting and leaving infested materials also will help stop the spread of the infestation. If trees are to be cut and left on site, infested trees and an additional buffer of 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 4–5 ft (1–2 m) sections.

Recent research has shown that the use of inhibitory compounds and attractants (Goyer et al. 1998) also can 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 NSAHR NWA in urban or high visibility areas where tree damage and tree replacement costs would be high.

4.5.3.2 Ips Engraver Beetle

The ips engraver beetle (*Ips avulsus*) is another serious pest of 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, destruction of bark and slabs, and removal of slash material greater than 4 in (10 cm) 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.

4.5.3.3 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 U.S. 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.

Evidence of infestation is the appearance of chewed or girdled stems or twigs in the spring and fall. 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 also may occur underground. Saplings and larger trees also may 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 integrated pest management (IPM).

4.5.3.4 Gypsy Moth

The gypsy moth (*Lymantria dispar*) is one of the most notorious pests of hardwood trees in the eastern U.S. The species was introduced into the U.S. in 1869 in Massachusetts and by 1987 the gypsy moth had established itself throughout the Northeast before spreading south into Virginia and West Virginia and west into Michigan. Infestations have occurred as far as Utah, Oregon, Washington, and California. Management tactics to minimize the damage from gypsy moth infestations and to contain gypsy moth populations at levels considered tolerable include monitoring populations, maintaining health and vigor of trees, discouraging gypsy moth survival, and treating with insecticides to kill larvae and protect tree foliage (USDA Forest Service n.d.a).

4.5.3.5 Sudden Oak Death

Sudden oak death was first noticed in 1995 and is now a recognized disease that kills oaks and other plant species. The pathogen responsible for the disease is a fungus-like organism called *Phytophthora ramorum*. Although the diseases have been found only in California and Oregon within the U.S., it is of great concern to land and forest managers in the eastern U.S. because several eastern oak species, including pin oak (*Quercus palustris*) and northern red oak (*Q. rubra*), are highly susceptible to the disease. A pest management specialist should be contacted if there is a suspicion that the disease is present in a new location.

4.5.3.6 Elongate Hemlock Scale

Elongate hemlock scale (*Fiorinia externa ferris*), native to Japan, is a pest of eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*T. caroliniana*) in the eastern U.S. Elongate hemlock scale attacks the lower surface of the hemlock needle where it removes fluids from the cells. Scale populations build slowly on healthy trees but can move at a faster rate on stressed ones. Infected trees often die within the next 10 years although some survive longer in a severely weakened

condition. Maintaining trees in health condition will discourage the buildup of scale populations. Applications of nitrogen fertilizer and broad-spectrum insecticides can exacerbate the pest program as nitrogen enhances the survival, development rate, and fecundity of *Fiorinia externa ferris.* In forests, declining hemlocks should be salvaged to prevent buildup and spread of scale populations (USDA Forest Service n.d.b).

4.5.3.7 Dogwood Diseases

Flowering dogwood is widely planted in home and commercial landscapes and is popular for its early season display of flowers and bright red berries; however, this plant is susceptible to a large number of diseases that vary in impact from merely disfiguring foliage and flowers to those that completely kill the tree. Dogwood anthracnose, caused by the fungus *Discula destructive*, was first reported in New York and Pennsylvania but has now spread through Maryland, West Virginia, Virginia, and North Carolina. The fungus produces masses of spores on infested leaves or bark. Control is centered on cultural practices and fungicidal sprays. Maintenance of vigorous dogwoods is recommended, including pruning and disposal of diseased twigs and branches, removing epicormic branches that develop on the trunk and raking and disposal of leaves. Other dogwood diseases impact leaves and flowers, produce cankers on the main trunk, or are associated with root rot. In general, proper planting and maintenance are the best ways to avoid diseases.

4.5.4 Water Quality and Wetlands Protection

Forestry operations, like any ground-disturbing activity, have the potential to impact water quality; however, a silvicultural exemption to Section 404 of the CWA does allow normal and established silvicultural activities in wetlands for an established operation, 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 converting 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.

A conceptual design for two forest buffer BMPs was designed for NSAHR HQ Complex. The two forest buffers would reduce pollutant runoff to the Chesapeake Bay. The forest buffers would reduce nitrogen by 11.67 pounds, total phosphorus by 1.61 pounds, and total suspended solids by 350 pounds per year (Navy 2019f). A stream restoration improvement project was also designed as a BMP; the project will treat stormwater runoff and reduce the amount of sediment and pollutants entering the Chesapeake Bay (Navy 2019g). A conceptual design for two constructed wetlands at NSAHR PA was designed to provide water quality treatment form a parking lot located between two buildings (Navy 2011). The already shallow depression accepts runoff from a part of a drainage area, and is capable of removing 8.91 pounds of nitrogen, 1.84 pounds of phosphorus, and 525.53 pounds of total suspended solids.

BMPs designed to minimize impacts of timber harvesting and other forest management activities on soil and water resources are described in the VDOF BMPs Guide for Water Quality and North Carolina Forest Service's BMP Manual. North Carolina Forest Service also provides a BMP Quick Reference Field Manual.

The Virginia Department of Forestry BMP Guide for Water Quality, Fifth Edition (2011) is available on the VDOF website: http://dof.virginia.gov/water/index.htm

The North Carolina Forest Service BMP Guide for Forestry Operations (2006) is available on the North Carolina Forest Service website: http://ncforestservice.gov/water_quality/bmp_manual.htm

The North Carolina Forest Service BMP Quick Reference Field Manual (no date) is available on the North Carolina Forest Service website: http://ncforestservice.gov/water_quality/bmp_fieldguide.htm

4.5.5 Forest Administration

Annual work plans by forest stand serve as the basis for funding authorizations and progress evaluations by the NAVFAC and regional foresters. Data on costs, timber harvest volumes, reforestation, and other pertinent information should be incorporated into the timber inventory spreadsheets to keep the data up to date. Specific annual work plans take these data, stand health, site conditions, and timber markets into account. The regional forester provides guidance and assistance in planning and implementing the forest management program as well as preparing contract specifications, obtaining bids, and helping to guide harvesting operations. Project boundaries for all planned forest operations will be located and mapped using global position system data to prevent interference with other Installation activities and inadvertently crossing property boundaries.

4.6 Vegetative Management

The primary goals of grounds maintenance and urban forestry are to provide an attractive, well-maintained working and living environment for installation personnel and to protect the real estate value of NSAHR. The landscaped trees, shrubs, and wooded areas in the administrative, housing, and developed portions of NSAHR constitute NSAHR's urban forest. Care and maintenance of the urban forest is important for the safety of Installation personnel and their dependents and the protection of Navy real estate. Hazard Tree and Health Assessments of Urban Area Trees are part of the Navy's Urban Forestry and Landscape Management Program; the results from these assessments for NSAHR NWA were completed in 2017 (Tetra Tech and Carolina Silvics 2017a). No urban forest inventories or hazard tree assessments have been completed for NSAHR HQ Complex, NSAHR LRA, or NAHR PA. NR staff are the subject matter experts on urban forestry and should be consulted on tree care and maintenance issues. In accordance with the INRMPs Tree Preservation and Replacement Guidance (Appendix J), NR staff are required to review new grounds maintenance contracts prior to issuance, and oversee tree pruning or removal orders. Proponents of all projects and activities that may affect existing trees are required to consult with NR staff to identify all trees in the affected area and develop a project/activity-specific tree preservation plan. This requirement helps to ensure the health and longevity of the urban forest, so it will continue to provide the social, environmental, and economic benefits to the urban landscape. The Installation Architecture and Beautification Plans also include landscaping information, and implementation of these is coordinated through the Installation NRM to ensure compliance with the INRMP requirements. These plans were not reviewed by natural resources

personnel, and landscape plantings require this coordination to address the inclusion of non-native plant species that are recommended in these plans for landscaping vegetation.

Improving shade tree and urban forest resources through participation in programs such as Tree City USA and implementation of the Tree Preservation and Replacement Instruction for Navy Region, Mid-Atlantic Installations (Appendix J) is a high priority of the NRP.

Tree City USA certification is awarded to communities with urban forestry programs that meet several qualification criteria. Specifically, the community must:

- have a tree board or department,
- implement a tree care ordinance,
- support a forestry program with an annual budget of $2 or more per capita, and
- participate in an annual Arbor Day observance and proclamation.

Receiving the Tree City USA award from the National Arbor Day Foundation is recognition that NSAHR NWA has a progressive urban forest management program that is striving to improve this resource. In order to be recertified each year, NSAHR HQ Complex and NSAHR NWA must continue to meet these criteria and submit a recertification package to Virginia Department of Forestry (VDOF). A recertification application and a proclamation (2020) is located in Appendix J.

Details about the Tree City USA program qualification standards and certification are on the National Arbor Day Foundation website:
http://www.arborday.org/programs/treecityusa.html.

The application for recertification by the Tree City USA program is available online at:
http://www.arborday.org/programs/treeCityUSA/apply.cfm.

No urban forest inventories have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. An urban forest inventory and survey of the trees and shrubs greater than ten (10) feet tall that were located outside of commercial forests at NSAHR NWA was performed in the spring of 2016 (Tetra Tech and Carolina Silvics 2017a). In addition, a desktop inventory of trees and shrubs was conducted using aerial photography. Prior to the inventory, Carolina Silvics, Inc., in consultation with Tetra Tech, Inc. and natural resource personnel from NAVFAC Mid-Atlantic, developed a database of information to be collected for each inventoried tree.

Survey type was based on management scale. In most cases, the unit of management is a single tree, defined as all stems arising from a single root stock. This single root stock was therefore inventoried as a point feature in GIS. In some cases, however, the unit of management is a grouping of trees; a non-commercial forest patch or woodlot such as a wooded agricultural ditch; or a small woodlot along a road or between buildings. These management units were inventoried as polygon features in GIS.

Approximately 1,676 ac of NSAHR NWA's 3,665 ac (45.7%) are not comprised of commercial forest assets. This area includes helicopter landing pads, parking lots, recreational fields, buildings, antennas and antenna clear zones, training areas, and agricultural fields. There are 1,054 field-surveyed individual urban trees and 48 field surveyed non-commercial forest patches (comprising 26 ac) at NSAHR NWA within this area. There are also 35 desktop surveyed individual trees/shrubs and 23 desktop surveyed non-commercial forest patches (comprising 299 ac). Crepe myrtle is the most abundant species of individually surveyed trees. This non-native tree species comprises 20% of all individual trees with 208 specimens. The second most abundant species are the native sycamore (*Platanus occidentalis)* and loblolly pine, each comprising 8% with 83 specimens each. As such, the Installation's urban forest does not meet diversity recommendations at the species level. It does, however, meet recommendations at the genus and species level with 20% of stems being Lagerstroemia in the Lythraceae family.

The survey showed that the selection of trees and shrubs in the landscape were over planted or planted too close to the foundation (one to two feet) of buildings forming a permanent hazard to the buildings and to the trees themselves, as they are not growing vertical, but are leaning away from the structure. The majority of individual trees at NSAHR NWA are healthy and present no immediate hazards (89% and 92%). Only 11 trees are dead, with another 4 showing signs of decay. The primary causes of death appear to be environmental stress (such as drought) or human stress (injury from landscaping, interactions with vehicles, etc.). There are 55 trees that need to be removed, 29 trees that need to be pruned and 7 trees that should either be pruned or removed. Dead limbs (34 stems) are the main hazard with another 28 stems having some interaction with a building or utility and 11 stems having dead tops.

Species were designated as invasive using NatureServe I-rank information in combination with the invasive plant species brochure provided in this INRMP. Only one invasive species was surveyed as individual stems during this inventory - 13 stems of Callery pear *(Pyrus calleryana),* representing only 1% of surveyed stems.

There are 48 field surveyed non-commercial forest patches (26 ac) at NSAHR NWA. These patches are primarily mixed pine-hardwood stands ranging in height from 40 to 70 feet. Some of these stands are early successional in nature and others contain mature hardwoods. They range from agricultural ditch banks to noise/sight barriers to training areas. One of these patches, NWA-P-0048, contains mimosa *(Albizia julibrissin),* an invasive species. Trees in this patch average 35 feet in height and 6 inches in DBH.

The inventory also found that 31% of individually inventoried urban trees at NSAHR NWA are non-native. Future replacement planting at NSAHR NWA should emphasize the use of native shrubs and trees. New planting in the landscape should also favor those flowering trees and shrubs that can create habitat corridors through developed areas of NSAHR NWA.

4.6.1 Beneficial Landscaping

Direction for landscaping and urban forestry at NSAHR comes from several sources. EO 13148, *Greening the Government through Leadership in Environmental Management*, requires federal agencies to incorporate the principles and practices of beneficial landscaping as specified in the Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices

on Federal Landscaped Grounds (60 CFR 40837). Specifically, federal projects are required, to the extent practicable, to:

- 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.

EO 13112, *Invasive Species*, requires federal facilities, to the extent practicable and permitted by law, to prevent the introduction of invasive species; to detect and control such species; to accurately monitor invasive species populations; to provide for restoration of native species and habitats that have been invaded; to conduct research on invasive species to prevent their introduction and provide for environmentally sound control; and, to promote public education on invasive species.

The Armed Forces Pest Management Board recommends policy, provides guidance, and coordinates the exchange of information on all matters related to pest management throughout the DoD. The Armed Forces Pest Management Board's mission is to ensure that environmentally sound and effective programs are present to prevent pests and disease vectors from adversely affecting DoD operations. The Armed Forces Pest Management Board promotes integrated pest management, the least use of biopesticides and toxic pesticides for installations and deployments, and advocates the use of personal protection measures against vector-borne disease.

The National Invasive Species Act was enacted to prevent invasive species from entering the Great Lakes through ballast water and is carried out by several federal agencies including the USFWS, DoD, EPA, USACE, NOAA, and USCG. Organisms that are targeted by the National Invasive Species Act are categorized as aquatic nuisance species, including in particular zebra mussels and Eurasian ruffle. The Act authorizes regulation of ballast water, funding for prevention and control research, regional involvement with the Aquatic Nuisance Species Task Force, and education and technical assistance programs to promote compliance with the regulations.

The MOU for Federal Native Plant Conservation is an agreement between several federal agencies including DoD, USFWS, USDA NRCS, and others. The purpose of the MOU is to establish and describe a Federal Native Plant Conservation Committee that will identify and recommend, as appropriate, priority conservation needs for native plants and their habitats and coordinate implementation of programs for addressing those needs.

The preferential use of regionally native plant species over nonnative species is particularly important as they are generally better suited for local site conditions, reduce the need for intensive maintenance, and require less fertilizer and pesticides. Native plant species also are less likely to become invasive pests than nonnative species and can serve as better sources of food and cover for native wildlife. The overuse of nonnative species, such as Bradford pear and crepe myrtle, is not consistent with beneficial landscaping practices and should be avoided. These species offer

few environmental benefits and, in the long run, increase maintenance costs because of pruning and care requirements.

Effective use of native trees and shrubs in landscaping also can provide economic and environmental benefits to NSAHR. 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 water quality improvement. Trees and shrubs in the landscape reduce the impact of precipitation, reduce flow velocities, and capture and store 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. For NSAHR HQ Complex, landscaping guidance instructs landscaping to maintain a campus-like appearance.

Selecting species that are suitable for a site requires knowledge of plant characteristics such as the mature size, longevity, tolerance to soil compaction and pollution, and susceptibility to disease and insect pests. A list of plant species native to the Tidewater region and that may be suitable for landscaping purposes is in Appendix J. 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. Planting details and tree care instructions are also in Appendix J.

Beneficial landscaping practices also are associated with LID practices and LEED program requirements, as discussed in Section 4.2.4.

4.6.2 Selection of Plant Materials for Landscaping

The size of plants to be used depends on budget, site conditions, planting season, available labor, and desired results; however, only plants that are native to the coastal plains physiographic province of Virginia and North Carolina should be utilized for vegetation and landscaping activities on NSAHR. Final approval of species to be planted should be obtained from the NRM prior to planting.

A list of plants that are native to the coastal plains physiographic province of Virginia is available on the VDCR Natural Heritage website: http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml#buy.

Trees, shrubs, and herbaceous species can be purchased from the VDOF on it its website: http://www.dof.virginia.gov/tree/index.htm.

A list of plants that are native to North Carolina is available in North Carolina State University Cooperative Extension's Landscaping for Wildlife with Native Plants Guide: https://content.ces.ncsu.edu/landscaping-for-wildlife-with-native-plants.

A list of nurseries that sell native seeds and plants in North Carolina is available online at: http://www.ncwildflower.org/natives/sources.htm.

The North Carolina Forest Service Seeding Catalog (2019-2020) is available online at: http://ncforestservice.gov/nursery/pdf/NCFS_Tree_Seedling_Catalog.pdf.

A Digital Atlas of the Virginia Flora, which identifies plant species as native or non-native, is available online at: http://www.vaplantatlas.org/.

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 on 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-in (15-cm) tube-grown seedlings (tublings) to large pots or ball and burlap 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 ball and burlap 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. Ball and burlap 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.

4.6.3 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. Since roots are often damaged in the transplanting process, planting during the fall allows additional time for root development before the summer months when transpiration peaks. Ground cover 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 become established quickly and improve its health and

longevity. Planting techniques differ somewhat with the type of material being planted, although 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 J. 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 Installation personnel or qualified tree care professionals.

4.6.4 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. Overwatering can deprive the tree of air and also should 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 3– 4 in (8–10 cm) 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, since each cut has the potential to cause damage to a tree, no branch should be removed without a reason. As with planting, pruning should only be performed by qualified tree care professionals or trained personnel.

Care and maintenance of the NSAHR's existing urban trees also is important, particularly for the safety of Installation personnel and their dependents and the protection of real estate. Proper training and supervision is necessary for all Installation personnel involved with tree care, pruning and hazardous tree removal. Appropriate pruning guidelines are presented in Appendix J.

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

4.7 Migratory Bird Management

The Migratory Bird Treaty Act of 1918 (MBTA) is the primary legislation in the United States established to conserve migratory birds. It implements the United States' commitment to four bilateral treaties, or conventions, for the protection of a shared migratory bird resource. The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation. The species of birds protected by the MBTA appear in Title 50, Section 10.13 of the Code of Federal Regulations (50 CFR 10.13). On December 2, 2003, the President signed the 2003 NDAA. The NDAA provides that the Secretary of the Interior shall exercise his/her authority under the MBTA to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense. Congress defined military readiness activities as all training and operations of the Armed Forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Congress further provided that military readiness activities do not include the following:

- Routine operation of installation operating support functions such as administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; moral, welfare, and recreation activities; shops; and mess halls
- Operation of industrial activities
- Construction or demolition of facilities used for the purpose described in the above two bullets

The final rule authorizing the DoD to take migratory birds during military readiness activities was published in the Federal Register on 28 February 2007. The regulation can be found at 50 CFR Part 21. The regulation provides that the Armed Forces must confer and cooperate with the USFWS on the development and implementation of conservation measures to minimize or mitigate adverse effects of a military readiness activity if it determines that such activity may have a significant adverse effect on a population of a migratory bird species.

The requirement to confer with the USFWS is triggered by a determination that the military readiness activity in question will have a significant adverse effect on a population of migratory bird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem. A population is defined as, "migration routes, and wintering areas that are temporally and spatially stable, sufficiently distinct geographically (at some point of the year), and adequately described so that the population can be effectively monitored to discern changes in its status." Assessment of impacts should take into account yearly variations and migratory movements of the affected species.

To address the unintentional take of migratory birds as a result of activities necessary to support the military mission, a MOU was adopted between the DoD and the USFWS, as required by EO 13186, *Migratory Birds*, on 31 July 2006 (Benton et al. 2008). This MOU allows the military to obtain permits for the "unintentional take" of a migratory bird if it is in support of a military readiness operation. The procedures contain significant safeguards to ensure that the taking of birds is minimized when the new rule is used and that conservation measures are employed to compensate for the losses that may occur. This MOU was to expire on 31 July 2011; but was extended to 31 July 2013 and signed in 2014. In addition, an MOU between USFWS and the EPA for MBTA requirements and Pesticide Programs was released for public comment in February and March 2013, with an anticipated signature date in mid-2014. The MOU was signed in 2017 (USFWS 2017).

Migratory bird management at NSAHR includes a Nest Box Program at NSAHR NWA (see Section 4.4.4), bird surveys, and promotion and participation in programs including the North American Waterfowl Management Plan, Neotropical Migratory Bird Conservation Act Program, Wetlands Protection and Enhancement Programs, Department of Defense Partners in Flight Strategic Plan, Waterbird Conservation for the Americas, Partners in Flight North American Landbird Conservation Plan, United States Shorebird Conservation Plan, and Watchable Wildlife Programs. Per the MOU the Navy must evaluate and coordinate with the USFWS during the annual INRMP review process on any potential revisions to migratory bird conservation measures taken to avoid or minimize take of migratory birds (DoD and USFWS 2006).

The USFWS established National Bald Eagle Management Guidelines in 2007 that include protective measures outlined in the Bald and Golden Eagle Protection Act (BGEPA) (16 USC §668–668c) and the MBTA (16 USC §703–712). Both the BGEPA and MBTA protect bald eagles by prohibiting anyone from taking or disturbing (including killing, selling or otherwise harming) bald eagles and their nests or eggs. Of note, the National Bald Eagle Management Guidelines have 8 specific guidelines depending on project site-specific circumstances. Buffers vary from a minimum of 350 ft (15 m) and 660 ft (200 m), to a half mile (805 m) and depend on time of year (i.e., breeding season).

No bald eagle nests are known to occur at NSAHR; however, if a bald eagle nest is identified at NSAHR in the future, compliance with USFWS and VDWR will need to be addressed. The National Bald Eagle Management Guidelines provide specific guidance on project and site-specific circumstances and should be followed to the maximum extent possible if and when applicable.

The most expedient way to ensure compliance with USFWS guidance regarding bald eagles is to utilize the USFWS Virginia Field Office's Project Reviews in Virginia web-application available at: http://www.fws.gov/northeast/virginiafield/endspecies/project_reviews.html. The application provides a step-by-step online review of a project's potential impacts on known populations of federally listed threatened and endangered species, federal candidate species, federally designated critical habitat, and bald eagles and can either "self-certify" compliance with USFWS coordination requirements or expedite additional review by the USFWS. If proposed activities are in compliance, there is no further need to contact USFWS or VDWR.

The Neotropical Migratory Bird Conservation Act (Public Law 106-247), enacted in 2000, provides grants to countries in Latin America and the Caribbean, and the U.S. for the conservation of Neotropical migratory birds that winter south of the border and summer in North America. The Act encourages habitat protection, education, research, monitoring, and capacity building to provide for the long-term protection of Neotropical migratory birds. Through the Act, a competitive grant program is administered by the Secretary of the Interior to provide financial resources and to foster international cooperation for conservation initiatives.

In 2008, the DoD approved the Coordinated Bird Monitoring Plan. The objective of the plan, jointly designed by the DoD and USGS biologists and managers, is to provide a comprehensive approach for helping the DoD fulfill its responsibilities under regulations that pertain to migratory birds. The plan outlines procedures for ensuring that bird monitoring and assessments address important issues for the DoD; follow accepted procedures for design, data collection, and analysis; and preservation of data in long-term archives. A CBM Database has been established by the USGS, which DoD installations may use for long-term storage of their bird monitoring data. This will assist in the identification of species of concern on installations and the implementation of appropriate management strategies (DoD 2012). In 2012, USGS published the *Coordinated Bird Monitoring: Technical Recommendations for Military Lands* report in cooperation with DoD (USGS 2012). The report contains 12 recommendations that would result in a comprehensive, efficient, and useful approach to bird monitoring if followed. DoD has agreed to consider implementing these recommendations; however, final decisions will be based upon such factors as the availability of resources and military mission considerations.

There are no DoD CBM studies completed for NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. A DoD CBM Study was completed at NSAHR NWA in 2019 to update the bird inventory and assist in management of migratory birds. The findings for this study are summarized in Section 2.8.2.1 Birds.

Projects and activities at NSAHR recommend precautions to avoid negative impacts to migratory birds that have the potential to occur during implementation of the project/activity. Landscape alterations (i.e., tree removal, mowing, land clearing) are recommended to occur during the months of November through February, as recommended by USFWS to minimize impacts to migrating and nesting birds. If this cannot be accomplished, additional coordination with NSAHR NRS or NRM staff is required. As such, if birds of conservation concern are identified as utilizing the affected project/activity area, additional consultation with USFWS and compliance with any USFWS-issued permits may be required.

It is recommended that activities that may impact nesting migratory birds (i.e., mowing, herbicide applications, noxious weed control, brush clearing, tree trimming and thinning) requires that these activities be conducted during the non-breeding season to the maximum extent practicable. For tree trimming and thinning, or brush removal activities that must be conducted during the active breeding season, a pre-project clearance survey must be conducted by a qualified biologist to identify any active nests, and identification of avoidance measures for particular nests identified during the survey. If any nests are found during these surveys, these nests cannot be removed and the NRM must be notified of the nest locations. If significant impacts to nesting birds are anticipated from a project/activity, the project may be delayed until such impacts can be

minimized, or other approved mitigation is identified by the Navy or through the agency consultation process.

4.8 Invasive Species Management

The primary objectives of invasive species management at NSAHR are to prevent interference with military operations and preparedness by protecting infrastructure, real property, and human health and safety; and to control the spread of invasive species to the maximum extent practicable. The Environmental Services Department responds to service calls for removal of non-migratory birds and control of certain feral animals. Forest pests, nuisance wildlife, and invasive species are pest management issues that also are addressed by NR staff.

In 2003 the Navy conducted the Environmental Assessment for the Treatment of Invasive Species at Hampton Roads Naval Installations (Navy 2003). The proposed action was the eradication and prevention of the spread of invasive species, specifically common reed (*Phragmites australis*) and kudzu (*Pueraria montana* var. *obata*). The proposed action included aerial spraying of approximately 66 ac of land with Glyphosate at five Navy installations within the Chesapeake Bay watershed, followed by a spring mowing and/or controlled burn as needed to remove dead vegetation. The purpose and need for the proposed action was to prevent the further spread of phragmites and kudzu, which were overtaking native plant communities. Other alternatives included 1) aerial spray only, 2) controlled burning and mowing only, and 3) no action; however, the proposed action demonstrated better success in controlling both species.

The EA established that the proposed action had no significant adverse environmental impacts as long as proper application of Glyphosate was conducted and followed directions on the label. The spraying would also be conducted by a certified contractor with over 20 years of experience, and only under specific environmental conditions. The EA determined that no cultural resources, wetlands, or threatened and endangered species would be significantly impacted. The EA also determined that a small increase in particulate matter would wash into immediate water bodies of treated areas as a result of rainfall shortly after prescribed burns. Air and surface water resources were determined to degrade temporarily due to the use of helicopters to administer the herbicide and during prescribed burns and mowing operations; however, the degradation was not expected to be significant due to the short duration of the proposed action. No significant impact to minority, low-income populations would occur nor would the safety and health of children be impacted (Navy 2003).

The use of chemical pesticides and herbicides for control of weeds, and invasive and nuisance species are the primary pest management issues in the Operations Management Unit. In accordance with the soil and water conservation plans which are a component of agriculture outleases, any pesticides and herbicides used on the agricultural outlease parcels have to be approved and registered by the EPA, and usage reported to NAVFAC annually via either a Pesticide Application Reporting form or online via NAVFAC Online Pesticide Reporting System. Lessees also are responsible for control of any state or federal noxious weeds that occur on the leased parcels. Any pesticide utilization must have had a spray plan prepared, reviewed, and approved by all appropriate Navy environmental media managers. The NAVFAC Entomology Department will review any proposed pesticides and approve or deny the use of said pesticides in association with the proposed action.

A list of Virginia's invasive species, methods of control, and fact sheets are available on the VDCR-DNH website: https://www.dcr.virginia.gov/natural-heritage/invspinfo.

Fact sheets on invasive plants in North Carolina including species characteristics, habitat, and management options are available on the North Carolina Invasive Plant Council website: http://nc-ipc.weebly.com/nc-invasive-plants.html

Separate lists of invasive plant species for Virginia and North Carolina are provided in Appendix F. Specific to the Installation, an invasive species survey was completed in 2013 to identify invasive species populations throughout the Installation. In addition to the invasive species report, an invasive plant list was developed for Hampton Road installations. (see Section 4.8). An invasive plant species management plan should be developed to create a strategy for long-term habitat protection and management on NSAHR NWA. Section 4.8.2 identifies the Installation's two preferred methodologies for control of invasive plant species.

Nuisance wildlife surveys have been completed at NSAHR NWA to identify nutria and coyote populations (Tetra Tech and Stell Environmental Enterprises 2014), and a nuisance wildlife assessment and management plan is currently being developed, which will identify nuisance wildlife habitat and locations and include suggested removal methods. A copy of this plan will be included in Appendix I once available.

4.8.1 Nuisance and Invasive Wildlife

CNRMA Instruction 11015.3, *Natural Resources Management for Fish and Wildlife, Feral Animals, Invasive Species, and Certain Pests*, assigns responsibilities and provides points of contact for nuisance wildlife issues at NSAHR. At NSAHR, the NRM is responsible for promptly responding to emergency wildlife calls as needed, to ensure the safety of NR personnel, military, civilians, and wildlife. Potential nuisance and invasive wildlife problems at NSAHR include various species of native and non-native birds, foxes, raccoons, and feral animals.

Appropriate equipment such as various sized cages must be maintained by natural resources and environmental services staff to assist in the humane capture and transport of nuisance wildlife. Requests for services involving animals, such as game animals, migratory birds or raptors, not under the purview of the Environmental Services Department are referred to the NRM by service desk personnel.

VDWR defines nuisance wildlife in 4 VAC 15-20-160 and lists those species that are considered by Virginia as nuisance species; however, feral pets, Canada goose (*Branta canadensis*) and other waterfowl are not considered nuisance wildlife by this code. The code further states that "*It shall be unlawful to take, possess, transport, or sell all other wildlife species not classified as game, furbearer or nuisance, or otherwise specifically permitted by law or regulation*." To ensure compliance with this law, any nuisance wildlife removal or control activities performed by the environmental staff at NSAHR will be coordinated with VDWR as necessary, to make certain that methods employed do not violate Virginia law.

Pursuant to 4 VAC 15-20-160 the following mammal and bird species are designated as nuisance species: house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), black rat (*Rattus norvegicus*), black rat (*Rattus rattus*), coyote (*Canis latrans*), feral hog (*Sus scrofa*), nutria (*Myocastor coypus*), woodchuck (*Marmota monax*), European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), and rock dove (*Coloumba livia*). Other nonnative species as defined in the Migratory Bird Treaty Reform Act of 2004 and regulated under 50 CFR 10.13 also are included as nuisance species.

More information can be found at:

https://law.lis.virginia.gov/admincode/title4/agency15/chapter20/section160/

The NCWRC has identified American alligator (*Alligator mississippiensis*), North American beaver (*Castor canadensis*), American black bear (*Ursus americanus*), Canada goose, coyote, white-tailed deer (*Odocoileus virginianus*), fox (Family Canidae), striped skunk (*Mephitis mephitis*), raccoon, eastern gray squirrel, southern flying squirrel, and some venomous snakes as potential nuisance wildlife species (NCWRC n.d.). Primary nuisance species at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA include Canada goose, fox, eastern gray squirrel, raccoon, and feral cats. Woodchucks continue to pose an issue in agricultural outlease lands and should be monitored to assess future damage. NCWRC specifies trapping seasons and regulations for coyote and nutria. Coyotes may be trapped during any fox-trapping season, established by statute or by local law, using methods described in North Carolina Administrative Code Title 15A, even when those seasons open prior to and extend after the regular trapping seasons. Nutria is a regulated game species in North Carolina; however, there is no closed season and no bag limit for trapping nutria east of Interstate 77. A state license is required to trap coyote or nutria in North Carolina; however, animals causing property damage or found within a residential structure (house, apartment, etc.) may be trapped without a permit during the current trapping season for that species. Beaver are being managed by the NRP staff to minimize flooding concerns to the urban portions of the NSAHR NWA.

4.8.1.1 Nutria

Nutria are semiaquatic members of the rodent family and were intentionally or accidentally introduced to the southeastern U.S. between 1920 and 1940 for the fur industry (USGS 2020). Within 20 years of their introduction, nutria became a problem to farmers and native wildlife populations. Because of dense populations, nutria over-harvest preferred food species within their range resulting in the killing of native wetland plants and agricultural fields. This over-harvesting destroys productivity as less desirable species invade the impacted sites and increase erosion potential. Nutria also are known to feed on tree and shrub seedlings and can severely impact regeneration of some species. Burrowing in dams and levees is another type of damage caused by nutria. As their range and population have increased, the environmental and economic problems they cause also have increased. Using hardware cloth tubes or wire mesh plant guards may be necessary to protect bald cypress seedlings in planted wetlands and mitigation sites. Plastic seedling protectors may not deter nutria (USGS 2007).

There are no nuisance species surveys performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. A 2013 survey for nuisance species documented nutria presence and distribution to

provide baseline information at NSAHR NWA. The survey focused on mapping habitat and documenting occupancy and looked at GIS data layers from the most recent wetland delineations to create a potential habitat map. Local experts were consulted to improve the accuracy of the potential habitat map. Potential habitats were surveyed to 1) confirm that the polygon accurately identified the area as potential habitat and the extents of the polygon were appropriately depicted, and 2) search for nutria and nutria field sign to assess occupancy. Pedestrian surveys for nutria sightings, including signs (tracks, den, run, path, scat, slide, and eat-out areas) were performed at all potential habitats (Tetra Tech and Stell Environmental Enterprises 2014).

There were approximately 88 ac of nutria habitat. Several nutria were observed in two different areas during the survey and some indirect evidence of nutria occupation was observed. The first sighting was in the large tributary to Mill Creek, just north of IAMS Range, on both sides of Shotgun Road. The individuals retreated to a den site approximately 65 ft (19 m) west of Shotgun Road, on the north bank of the tributary. The second sighting was in an agricultural ditch parallel to Relay Road, approximately 1,200 ft (366 m) southwest of the intersection of Relay Road and Milepost Road. These nutria did not have a den that was visible, the entrance was under water and unable to be located. Tracks, slides, and den sites were observed. No other field signs were observed on NSAHR NWA. Several dens were observed near the southeast portion of the installation in fairly dry ditches. It is likely that during times of high water or after young nutria disperse, that they move into the less desirable ditches. No eat-out areas were noted. No significant damage to vegetation or ditch/stream banks was observed (Tetra Tech and Stell Environmental Enterprises 2014).

In addition to the nuisance and invasive wildlife species identified in this section, other species that pose a human health and safety concern, or that conflict with the military mission or military operations, may be designated as nuisance and/or invasive wildlife. Control of non-traditional nuisance/invasive species, or of species not listed under state regulation as a nuisance/invasive species may be conducted by NR staff once appropriate permits have been obtained from VDWR and/or USFWS.

Nuisance wildlife identification and control information is available from the USDA Animal and Plant Health Inspection Service Wildlife Services at:

http://www.aphis.usda.gov/wildlife_damage/

Shooting can be used as the primary method of nutria control in areas with dense populations. Shooting is most effective when conducted at night with a spotlight at an established bait station. Bait stations can be established on floating rafts or boards that are continuously lit by a spotlight and in view of the shooter. Alternately, increasing the hunting and trapping efforts at the Installation may help control the population, and a recreational hunter/trapper is employed by the Installation to assist with trapping nutria, in addition to other species such as coyote and fox. Controlling nutria populations, however, will mostly be implemented by NRMs as there will not likely be much interest in this species by hunters or commercial trappers. Nutria are designated as nuisance species and may be taken at any time (except on Sunday) by use of a firearm or other weapon (VDWR 2020). The NRP has maintained permissions via State Kill Permits that authorized NRP personnel to lethally remove nuisance, invasive, and sick wildlife 7 days a week.

The NRP hunting program maintains Sundays as no hunt days to allow NRP staff and volunteers and installation staff a day off. Further consideration of staffing abilities is underway to determine if it would be possible to staff Sunday hunting opportunities. Sunday hunting will not commence without adequate staffing and Installation CO approvals.

4.8.1.2 Coyote

Coyotes resemble small collie dogs, with pointed ears, a slender muzzle, and a busy tail. Coyotes are a top predator and can be useful in control of deer, Canada goose (by eating eggs), and rodents. They are most active at night and early morning, especially in areas where human activity occurs, and during the hot summer months. Coyotes can become a nuisance in urban areas by preying on pets and damaging livestock and crops. Coyotes can constitute a threat to public health and safety when they frequent airport runways and residential areas, and act as carriers for rabies (Internet Center for Wildlife Damage Management 2005). Prohibiting wildlife feeding and making sure pet food and garbage cans are secure are some steps residents can take to deter coyotes from frequenting urban areas. Since rodents can be attracted to fallen bird seed, seeds accumulating underneath bird feeders should also be routinely cleaned up.

There are no nuisance species surveys performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. A 2013 survey of nuisance species at NSAHR NWA was conducted and designed to overcome multiple confounding characteristics including a wide variety of habitats usage and difficulty of direct observations for obtaining an accurate index of coyote abundance. Site selection for scent stations included a review of aerial imagery of sufficient detail to depict roads; trails; paved areas; runways; and forested, scrub-shrub, pasture, and agricultural habitats. Eleven scent stations with cameras were established and both food bait and scent lure (attractants) were used at each station. Activity was recorded for six camera days. Only one coyote was captured on camera during the 6-day survey period, and a coyote per camera night detection index of 0.015 was documented (Tetra Tech and Stell Environmental Enterprises 2014).

4.8.1.3 Feral Cats and Dogs

Pets that have been abandoned or left behind by owners often become serious pests on military installations. Feral pets are a health and safety risk for base personnel and threaten wildlife populations, especially migratory birds. Removal of feral pets from the environment is a NR management goal. Feral animal control is jointly conducted by NR staff and other environmental staff. The CNO Policy Letter of January 2002 on Preventing Feral Cat and Dog Populations on Navy Property outlines the Navy's policy on feral pets (Appendix G). In accordance with Navy policy, NSAHR must adopt proactive pet management procedures that prevent the establishment of free-roaming cat and dog populations. Additionally, humane capture and removal of feral cats and dogs must be ensured, and every effort should be made to find homes for adoptable animals. Captured feral pets are taken to local NSAHR property animal control facilities.

Feral cat populations are a particular concern because of the threat they pose to native birds and small mammal species. Feral cat populations are controlled at NSAHR by encouraging responsible pet ownership and limiting access to food and shelter. Vaccination, registration, and tags are required for every pet on the Installation. Spay and neuter programs are promoted and all pets must be kept under strict supervision. Prohibiting the feeding of strays and ensuring all dumpsters are tightly secured are additional steps that control feral cat populations. NR personnel provide pet

and wildlife information to NSAHR personnel through the regional outreach specialist via educational brochures (Appendix G), NR awareness presentations, posted website information, Navy newspaper articles, and face-to-face conversations.

4.8.1.4 Feral Pigs

Feral pigs, which have existed in the region since early European settlement, are another problem species for native habitats and wildlife. Feral pigs (or Eurasian feral hogs) were first identified at NSAHR in October 2012 at NSAHR NWA. No feral pig surveys have been performed at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. One pig was removed from the Installation in 2012 and additional removal efforts were completed by VDWR on their Cavalier Wildlife Management Area (WMA). In March of 2013 the NRM and VDWR partnered to conduct a helicopter survey of the VDWR Caviler Property and NSAHR NWA to identify any active sign of the pig. It appeared from the helicopter survey effort and the lack of sightings by Installation NR staff, volunteers, hunters, and military personnel in 2013 that the Rapid Response and Removal efforts by the Navy and VDWR personnel removed the immediate threat from feral pigs at NSAHR NWA. The Navy continues to coordinate with VDWR to determine the presence of the species on the Installation and its rapid removal.

More information on feral pig management in Virginia can be found at:
http://www.dgif.virginia.gov/wildlife/feral-hogs/

4.8.1.5 Miscellaneous Vertebrates

A number of vertebrate species such as groundhogs (*Marmota monax*), squirrels (Family Sciruidae), mice (*Mus* sp.), rats (*Rattus* sp.), skunks (Family Mephitidae), opossums, and nutria can be considered nuisance pests in urban environments. State wildlife regulations prohibit capture and relocation of wildlife to other locations, as this could contribute to the spread of wildlife diseases. As such, wildlife captured at the Installation must be released within another area of the Installation, preferably within natural areas adjacent to the location of capture. Lethal methods of wildlife removal will not be used unless imminent danger to NSAHR NWA personnel exists, or if the species presence is damaging structures, disrupting the mission, causing a severe nuisance, or is otherwise intolerable.

4.8.1.6 Invertebrates

Ants, termites, bees, wasps, forest pests, and other invertebrates can cause destruction by invading and damaging structures. Ants are one of the most common household pests. Bees, wasps, and other social insect groups may establish nests in buildings and other Installation structures, causing health and safety hazards. Regular inspections and maintaining good sanitation (properly storing food, cleaning up grease and spills, etc.) can prevent infestations.

Termites can damage structural lumber, utility poles, and other wooden structures, as well as stored foods, books, and household furniture. Signs of termite infestation include swarming of winged forms in fall and spring, and evidence of tunneling in wood. Wood in damaged areas is typically thin and easily punctured with a knife or screwdriver (University of California Integrated Pest Management Online 2001).

Forests pests result when non-native insects and diseases are introduced into an ecosystem and cause environmental or economic damage. Although damage is inflicted on the host species, the impact of infestation can extend to associated plants and animals that depend on forested habitats. Forests pests can threaten forestry resources at NSAHR NWA, potentially contributing to an increased fire risk if the infestation is severe enough to cause large die offs (National Park Service n.d.). Section 4.5.3 provides additional information on forest and landscape pests. Gypsy moth sampling was conducted at NSAHR NWA from 1991-1996. Two traps were established in the Virginia portion of the Installation and two traps were established in the North Carolina portion. No gypsy moths were identified during this time frame.

4.8.2 Invasive Plants and Noxious Weeds

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 EO 13112 requires federal facilities, to the extent practicable and permitted by law, to perform the following activities:

- prevent the introduction of invasive species;
- detect and control such species;
- accurately monitor invasive species populations;
- provide for restoration of native species and habitats that have been invaded;
- conduct research on invasive species to prevent their introduction and provide for environmentally sound control; and
- promote public education on invasive species.

Management of invasive plant species at NSAHR is focused on the species and communities desired rather than on simply eliminating the invasive species. Priorities are set based on ecological significance, the severity of infestation, and the likelihood of successful control with available resources. Preventive measures keep invasive species from becoming established.

General control methods that are used to combat invasive species infestations include mechanical methods such as cutting, mowing, hand pulling, burning, and chemical applications of herbicides. Herbicide applications are most effective with species that have a large percentage of foliage to stems and roots such as grasses and nonwoody vines. For woody species, a combination of practices that includes cutting the larger woody materials and treating resprouting vegetation with a foliar application of herbicides is frequently recommended.

Herbicides may only be applied by licensed DoD employees or contractors in a manner consistent with all label instructions. All herbicides used must be approved by regional botanist and must be on the authorized user list. In addition, all outdoor pesticide use that is conducted in remote areas must be coordinated with NR personnel to ensure wildlife, plants, or their habitats are not affected. The Installation is utilizing two methodologies for control of invasive plant species: early detection and rapid response for new populations that have a high probability for eradication; and a phased removal approach of other species that are more widespread and where removal in a single targeted effort is not feasible. In 2014 a contract was awarded for the control of common reed, alligator

weed, aneilema (also commonly known as Asian spiderwort), and kudzu vine at four installations in southeastern Virginia and northeastern North Carolina, including NSAHR NWA.

Between 2014 and 2016, the awarded invasive plant species control efforts were conducted at four installations: NAS Oceana; NASO DNA; NALF Fentress; and NSAHR NWA. The target species were common reed, kudzu, Asian spiderwort, and alligator weed (*Alternanthera philoxeroides*). Golden bamboo (*Phyllostachus aurea*) was later added as a target species for the project (Navy 2018a).

The invasive species control treatments included herbicide application throughout the installations performed by trained, state-certified pesticide applicators. Direct foliar spraying was conducted from late summer to late autumn when this method is most effective for the target species and non-target species can be avoided. Direct foliar applications were conducted using approved herbicide solutions via utility vehicle-mounted sprayers for areas within locations accessible within reach (approximately 300 feet [91 meters]) of the utility vehicle hose reel or via backpack sprayer. For golden bamboo control, a combination of herbicide and mechanical treatment techniques were utilized. Table 4-3 lists the herbicides selected for use.

Table 4-3. Herbicides Selected for Invasive Species Control at Four Installations.

Brand Name	Active Ingredient	USEPA#	PAI/gal*
Clearcast®	Imazamox	241-437-572	1.0
Garlon 3A®	Triclopyr (salt)	62719-37	3.0
Rodeo®/Accord® Concentrate	Glyphosate	62719-324	5.4
Roundup® Custom	Glyphosate	524-343	5.4

*PAI/gal = pound(s) of active ingredient per gallon

Equipment decontamination was conducted prior to moving to another treatment area to avoid transmission of invasive plant species from one treatment area to another. GPS locations and photographs of each target species site were collected during treatment in all areas where GPS and photographs were permitted. Each year, a survey was conducted between June and October to determine the effectiveness of the herbicide application. Qualitative density classes were used to characterize the target species within a treatment area. The qualitative density classes, which relate generally to percent cover, were visually estimated as an average for the area treated. Numeric codes, 0 through 5, were used to express qualitative densities of species:

- 0 not found (0 percent cover)
- 1 low density (up to 20 percent cover)
- 2 low-medium density (20 to 40 percent cover)
- 3 medium density (40 to 60 percent cover)
- 4 medium-high density (60 to 80 percent cover)
- 5 high density (80 to 100 percent cover)

The post-treatment density classification of live vegetation was determined for the target species during the effectiveness assessment and compared to the pre-treatment density classifications.

The area of target invasive plant species treated along roadsides, ditches, fields, and wetland areas totaled 30.1 ac, which included 25.0 ac of common reed, 1.1 ac of golden bamboo, 1.4 ac of alligator weed, and 2.5 ac of Asian spiderwort (Figure 4-3, Navy 2018a).

The study noted that many of the treated sites at NSAHR NWA are expected to recover fully following the recommended treatment cycles and develop a full suite of native vegetative cover. Monitoring treatment sites for at least one to three growing seasons following treatment was deemed necessary to assess the recovery of native vegetation and determine if supplemental planting or seeding should occur.

A noxious weed is a plant that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources of the U.S., the public health, or the environment. Currently, no noxious weeds have been identified at NSAHR NWA; however, surveys for the presence of noxious weeds are conducted periodically, and the Installation takes precautions to avoid introduction of noxious weeds. Priorities for control of invasive species will be based on ecological significance, the severity of infestation, and the likelihood of successful control with available resources.

A list of Virginia's invasive species, methods of control, and fact sheets are available on the VDCR Natural Heritage website: https://www.dcr.virginia.gov/natural-heritage/invspinfo

Fact sheets on invasive plants in North Carolina including species characteristics, habitat, and management options are available on the North Carolina Invasive Plant Council website: http://nc-ipc.weebly.com/nc-invasive-plants.html

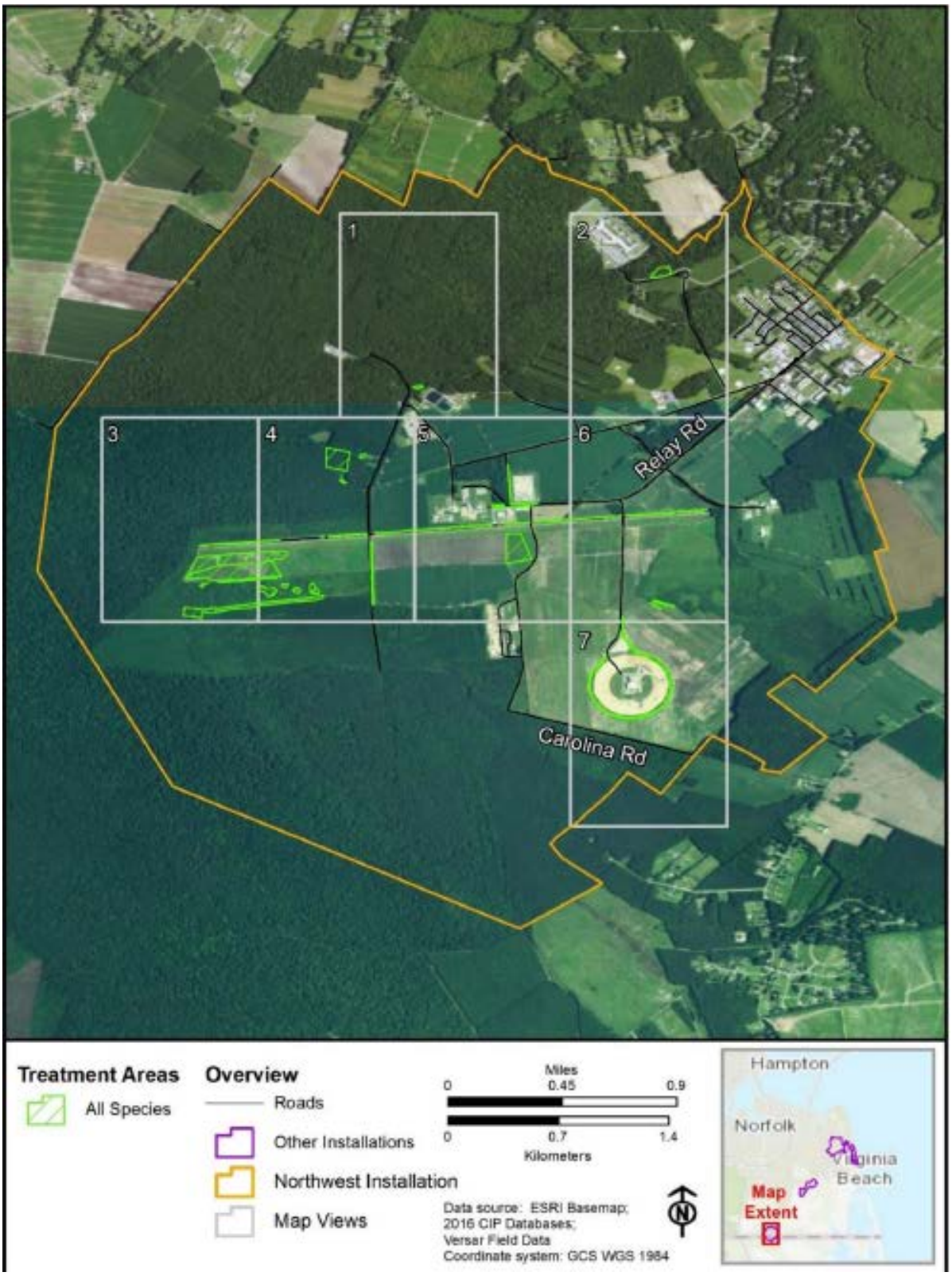

Figure 4-3. Distribution of target invasive plant species, occurring at NASHR NWA: common reed, alligator weed, Asian spiderwort, and golden bamboo.

4.9 Pest Management

The primary objectives of pest management at NSAHR are to prevent interference with military operations and preparedness by protecting infrastructure, real property, and human health and safety; and to control the spread of invasive species to the maximum extent practicable. The pest management program at NSAHR operates consistently with, and under the authority of, federal laws and military guidelines. These laws and regulations are implemented at NSAHR through the *Integrated Pest Management Plan* (Appendix I) and are overseen by the installation's integrated pest management coordinator:

- Federal Insecticide, Fungicide, and Rodenticide Act;
- Federal Noxious Weed Act of 1974;
- EO 13751 (Invasive Species);
- Occupational Safety and Health Standards (29 CFR 1910);
- EPA Regulations for Pesticide Programs (40 CFR 150-186);
- DoD Pest Management Program (DoDI 4150.07);
- Environmental Readiness Program Manual (OPNAV M-5090.1);
- Navy Occupational Safety and Health Program Manual (OPNAVINST 5100.23G);
- Navy Pest Management Program (OPNAVINST 6250.4C);
- Manual of Naval Preventive Medicine P-5010; and
- Design of Pest Management Facilities (AFPMB TG 17).

DODI 4150.07 defines "pest" as organisms that do not cause disease, but adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, materiel, or vegetation; or are otherwise undesirable. IPM is a science-based, sustainable, decision-making process that identifies and reduces risks from pests and pest management-related strategies. IPM coordinates the use of pest biology, environmental information, and available technology to prevent unacceptable levels of pest damage using the most economical means, while minimizing risk to people, property, resources, and the environment. (DoDI 4150.07). It is DOD policy to use IPM to control pests whenever possible.

In accordance with OPNAV Instruction 6250.4C, Navy Pest Management Programs, it is Navy policy to use an IPM approach to pest control. IPM uses ecologically, economically, and socially sound strategies to keep pests at tolerable levels. In IPM, a full range of pest control options (cultural, mechanical, biological, and chemical) may be employed after careful consideration of the pest's biology, the damage or infestation thresholds that require action, and the impacts each control alternative will have on the environment. A variety of biological, cultural, and mechanical pest management strategies used in IPM are included in the following discussions of the major types of pest issues that are relevant to the NRP at NSAHR. Invasive species includes both animal and plants species.

The pest management program at NSAHR is described in the Integrated Pest Management Plans for NSAHR PA and NSAHR NWA (Appendix I).

4.10 Land Management

4.10.1 Environmental Restoration Program Sites

NSAHR recognizes that adverse impacts to the natural resources addressed in this INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment. The Navy ERP has developed a Site Management Plan for NSAHR NWA which guides the management of the Environmental Restoration sites at the Installation, which consist of chemical hazardous waste, and Munitions Response Program sites, which includes hazards associated with munitions and their chemical constituents. The ERP is responsible for identifying such sites, considering their risks, and assessing the impacts to human health and the environment. This assessment must consider endangered species, migratory birds, and biotic communities. The ERP must develop and select response actions when it is likely that a release could result in an unacceptable risk to human health and the environment. When appropriate, the NSAHR NWA NRM helps the ERP Remedial Project Manager identify potential impacts to natural resources caused by the release of contaminants and participates, as appropriate, in the ERP decision-making process. As of July 1998, environmental restoration activities have been accomplished under the Comprehensive Environmental Response, Compensation, and Liability Act and the Superfund Amendments and Reauthorization Act are the primary legal authorities governing environmental restoration activities at DoD installations. Under the Comprehensive Environmental Response, Compensation, and Liability Act under a Consent Order. Munitions Response Program sites and Potentially Response Party sites are managed under their own programs, with state oversight only. The Armed Forces Bill (10 USC 2701) codifies the Defense Environmental Restoration Account, the funding mechanism for installation restoration.

There are no ERP sites at NSAHR LRA, or NSAHR PA. There are currently two ERP sites being funded under Environmental Restoration Navy funding: Camp Allen Landfill Area (Site 1 and Site 22) within NSAHR HQ Complex, and the NEX Fuel Service Station within NSAHR NWA.

4.10.2 Erosion and Sediment Control

Erosion and sediment control is provided by the Virginia Erosion and Sediment Control Law (Code of Virginia §10.1-560). The law requires that an erosion and sediment control plan be written and approved for any land-disturbing activity equal to or exceeding 10,000 ft^2 (929 m^2) in area. 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). Erosion and sediment control plans are submitted to NR staff for review as part of the environmental assessment process for projects that have the potential to significantly impact the environment. NR staff must be familiar with standards and specifications in the handbook and perform frequent site visits during construction activities to help ensure that compliance with erosion and sediment control plans and appropriate BMPs are being implemented. Additional training and certification in erosion and sediment control as offered by the VDCR would improve the effectiveness of erosion control efforts at NSAHR.

Stell Environmental Enterprises, Inc. (SEE) prepared an Erosion Control Plan (ECP) in 2013 under a NAVFAC contract. A survey of all erosion features was conducted at NSAHR NWA. The results of the erosion survey, documented in this ECP, will allow the installations to maintain compliance with regulations, such as the EPA CWA; prevent release of sediment to streams, ponds and wetlands; maintain productive land use; and ensure the safety of personnel using the lands.

Frequent mechanical scalping during mowing and other ditch maintenance practices that remove vegetative cover from ditches contribute to nonpoint source pollution. Maintaining a vegetative cover on drainage ditches is the primary mechanism for controlling nonpoint source pollution caused from ditches. Vegetation serves to slow water flow and filter sediments and other pollutants from runoff. Ensuring that vegetation is reestablished on eroded areas by including a scalping repair clause in mowing contracts is important to protecting water quality. Vegetation should be reestablished as soon as possible to stop the formation of gullies and slope failures. Inspections, particularly after storm events, for debris buildup, erosion, and other problem spots are required for proper ditch maintenance.

Proposed construction projects that disturb 1.0 ac. (0.4 ha) 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. 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. Sediment basins are a structural control requirement for sites disturbing 3.0 ac. (1.2 ha) or more. At sites disturbing less than 3.0 ac. (1.2 ha), sediment basins are encouraged, but other control methods may be employed.

Adherence to LID and LEED practices, as discussed in Section 4.2.4, can minimize problems associated with erosion and sediment control.

Erosion and sediment control training and certification programs offered by the VDEQ are described on the VDEQ website:
https://www.deq.virginia.gov/ConnectWithDEQ/TrainingCertification/ESCTraining.aspx

The Virginia Erosion and Sediment Control Handbook (1992) is available online at:
https://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx

The North Carolina Erosion and Sediment Control Planning and Design Manual (2013) is available online at: https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/erosion-sediment-control-planning-design-manual

Although it is still an issue, the low level of relief and variation in elevation does not result in major water quality issues at NSAHR. Several conceptual designs for sediment control BMPs have been proposed at multiple properties of NSAHR.

A conceptual design for two forest buffer BMPs was designed for NSAHR HQ Complex. The two forest buffers would reduce pollutant runoff to the Chesapeake Bay. The forest buffers would reduce nitrogen by 11.67 pounds, total phosphorus by 1.61 pounds, and total suspended solids by 350 pounds per year (Navy 2019f).

A stormwater BMP was also designed for NSAHR HQ Complex to treat stormwater runoff from lands that were developed before stormwater management was required. The BMP is required to treat stormwater runoff and reduce the amount of sediment and pollutants entering the Chesapeake Bay from lands that were developed before stormwater management was required. The objective of the BMP is to conduct a stream restoration to reduce pollutant export by preventing erosion and increasing the uptake of pollutants by plants and microorganisms. The goals will be accomplished by armoring eroded areas with rip rap and replanting banks with native species (Navy 2019g).

Proposed improvements to the project site focus on stabilizing the banks and reducing erosion. A scour pool immediately west of Ingersol Street can be engineered by hardening the existing pool with rock to stabilize the depth and width. Creation of a rock weir will help reduce the flow velocity and in turn allow sediment and pollutants to settle. In addition, scour protection for an electric utility that crosses the stream is also proposed, as well as rip rap to prevent scouring along the streambank. Other proposed improvements include the removal of a sprawling tree that is growing in the channel and reducing flow capacity, as well as general vegetation improvements. More specific improvement and feasibility details can be found in the final conceptual design.

Restoring the proposed stream reach will provide multiple environmental benefits. In general, improved water quality through reduced erosion and increased sediment and nutrient removal (Table 4-4) will be achieved. In addition, improvements to the stream bank and vegetation will enhance local and native habitat.

Table 4-4. Estimated Pollutant Removal from Stream Restoration.

	Loading (lbs/yr)	% Efficiency	POC Removed (lbs/yr)
Total Nitrogen	44.06	50	22.03
Total Phosphorous	20.29	50	10.15
Total Suspended Solids	38,640	50	19,320

Several erosion control sites were identified during the 2012 Erosion Inventory and Control/Repair Recommendations project for NSAHR NWA. In addition, a stream restoration BMP was identified during the 2017 Opportunity Assessment for the Second Permit Cycle of the Chesapeake Bay TMDL (Navy 2019g, see Section 4.2.3 Watershed Protection). Activities that remove vegetation and disturb the soil, however, do increase the risk of erosion and sediment and require protective measures.

A conceptual design for two constructed wetlands at NSAHR PA was designed to provide water quality treatment form a parking lot located between two buildings (Navy 2011). The already shallow depression accepts runoff from a part of a drainage area, and is capable of removing 8.91 pounds of nitrogen, 1.84 pounds of phosphorus, and 525.53 pounds of total suspended solids.

Other erosion and sediment control issues at NSAHR NWA are related to practices conducted on the agriculture outlease parcels and ditch maintenance throughout the Installation. Soil and water conservation plans for agricultural parcels have been developed by NR personnel to address nonpoint source pollution in agricultural ditches (Appendix K). Guidelines for maintaining no-till buffers along drainage ditches and maintaining ditches by mowing infrequently are included. Erosion can also be attributed to wildlife damage. Nuisance wildlife (e.g., nutria) damage streambanks via burrowing and vegetation removal, resulting in increased rates of erosion within these systems.

4.10.3 Oil and Hazardous Substances

The RCRA of 1976 is the primary federal law governing the disposal of solid and hazardous wastes. RCRA regulations are contained in Title 40 of the CFR, Parts 239–299, and include regulations for solid waste (40 CFR Parts 239–259) and for hazardous waste (40 CFR Part 260–279). Virginia regulations related to solid waste are described in 9 Virginia Administrative Code (VAC) 20-81, and regulations related to hazardous waste are described in 9 VAC 20-60. North Carolina regulations related to hazardous and solid waste are described in 15A North Carolina Administrative Code 13A (hazardous waste) and 13B (solid waste).

Oil and hazardous substances (OHS) are managed in accordance with the *2016 Hazardous Materials Reutilization, Hazardous Waste Minimization and Disposal Guide*, which was developed to communicate regulatory requirements and management procedures relevant to the utilization of hazardous materials, and minimization and disposal of hazardous waste for several Hampton Roads installations, including NSAHR. This guide is provided in Appendix H.

A *Spill Control and Countermeasures Plan* was finalized for NSAHR HQ Complex and NSAHR LRA in 2017 (Appendix H) and identified a total oil storage capacity of 98,698 gallons (373,613 liters) within both Installations. The plan establishes procedures, methods, equipment, and other requirements necessary to prevent the discharge of oil from NSAHR HQ Complex into or on navigable waters of the U.S. or adjoining shorelines (Appendix H). NSAHR PA contains 199,764 gallons (756, 189 liters) of total oil storage capacity.

NSAHR NWA has a total oil storage capacity (primarily diesel oil #2) of 171,097 gallons (548,317 liters). If a spill were to occur, this could cause injury to fish, wildlife, and environmentally sensitive areas. Information on the storage and handling of oil is provided in the installation *Spill Prevention, Control, and Countermeasures Plan* (Appendix H). The SPCCP was prepared in accordance with the provisions of 40 CFR 112, OPNAV M-5090.1, and state regulations. The purpose of the SPCCP is to prevent the discharge of oil from onshore facilities into or upon the navigable waters of the U.S. or adjoining shorelines, as well as to ensure early detection and quick response in the event of an oil discharge. This plan contains an inventory and description of each oil storage tank facility, information regarding environmentally sensitive areas, spill notification and response procedures, assessments of worst-case discharge, and post-discharge review procedures for the Installation. It does not include the 40 CFR 112 requirements for a Facility Response Plan which are fulfilled by the Integrated Contingency Plan for NSAHR NWA. The Integrated Contingency Plan is available for review at the PWD.

Navy policy requires commands to prepare for and to respond to Navy OHS spill/release incidents and to undertake immediate, direct action to minimize the effect of a Navy OHS spill/release upon human health and safety and the environment. These response efforts include, but are not limited to, reporting, investigation, containment, and cleanup requirements. The Hampton Roads *2016 Hazardous Materials Reutilization, Hazardous Waste Minimization and Disposal Guide* (Appendix H) contains reporting procedures for Navy personnel to take action to stop, reduce, or contain OHS spills.

4.11 Agricultural Outlease

The outleasing of land that is suitable for agriculture and is not used in direct support of the military mission is a practice that helps reduce grounds maintenance costs, earns revenue to support other NRPs, and benefits the local economy. Agricultural outlease programs must be balanced with, and used to achieve or maintain other natural resources needs, including the protection of rare, threatened, and endangered species; conservation of biodiversity; watershed protection; wildlife enhancement; and outdoor recreation. An example lease agreement and Soil and Water Conservation Plans are provided in Appendix K.

There are no agricultural outlease lands on NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. Approximately 649.1 ac (262.7 ha) at NSAHR NWA are part of the agricultural outlease program (Figure 4-4, Appendix K). Revenue collected through leasing Navy-owned property for agricultural use is deposited back into the NRP account and reallocated throughout the Navy by NAVFAC Headquarters, which supports a broad range of natural resources activities.

A Soil and Water Conservation Plan, developed cooperatively by NAVFAC Mid-Atlantic and Installation and regional NRMs, accompanies each agricultural lease agreement. The plan outlines restrictions for use of fertilizers and pesticides, and provides instructions with regard to conservation practices, maintenance of drainage ditches, and protection of cultural sites. In compliance with the 1990 Farm Bill recordkeeping requirements, pesticide and herbicide application reporting for the new outleases were mandated.

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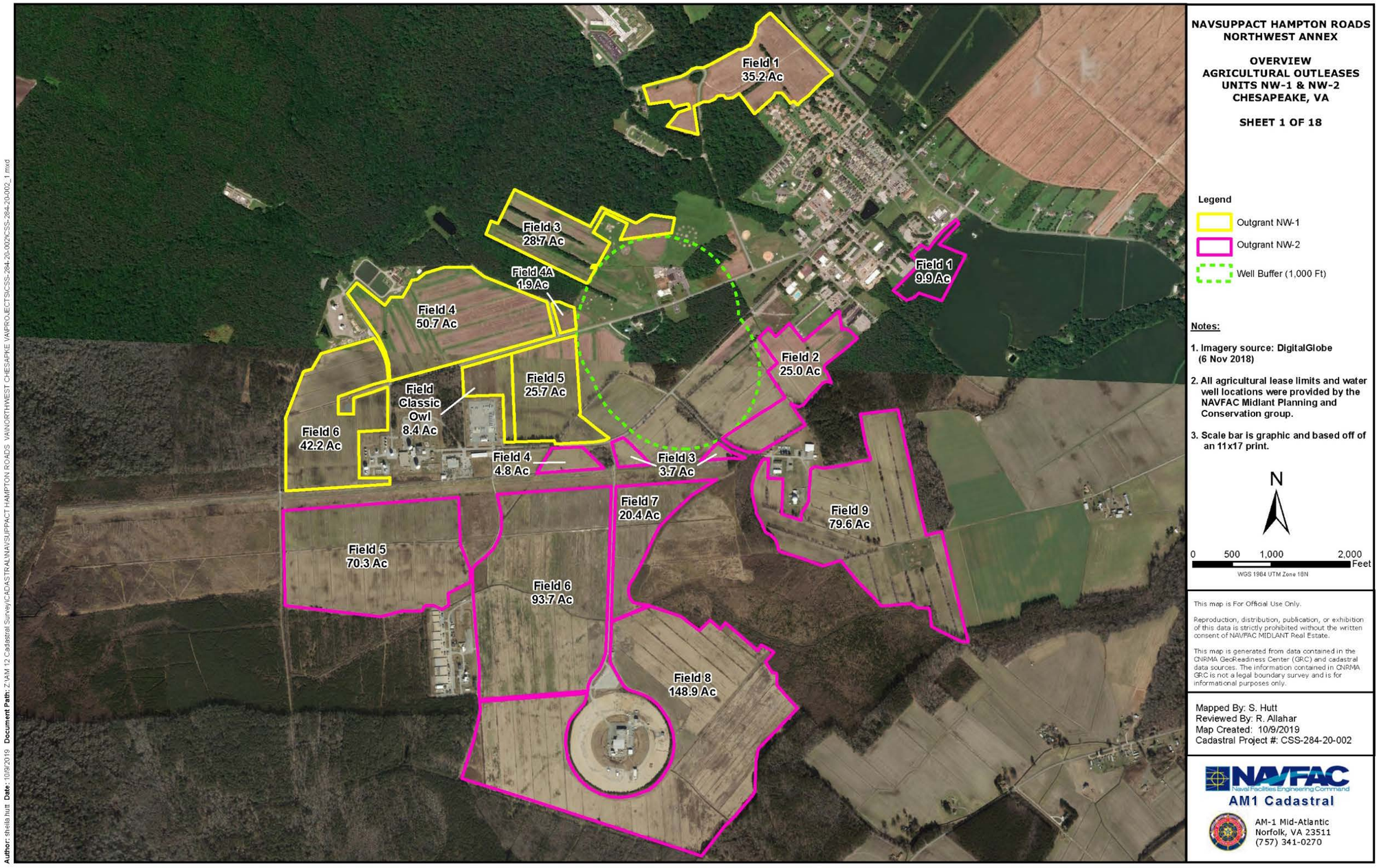

Figure 4-4. Agricultural Outlease Parcels within NSAHR NWA.

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4.12 Geographic Information Systems (GIS) Management, Data Integration, Access and Reporting

GIS is a powerful management tool that provides facility and environmental planners and NRMs with a comprehensive database that includes a spatial component. Information such as aerial photographs, resource delineations, monitoring data, and various surveys are all tied to geographical coordinate system data, which enhances a facility's ability to effectively coordinate and ensure that current and planned mission activities do not adversely impact watersheds, wetlands, floodplains, natural landscapes, soils, forests, fish and wildlife, prime and unique farmland, and other natural resources that must be protected, conserved, and managed using an ecosystem approach. Additionally, efficient and effective land use planning supports military readiness and sustainability while protecting and enhancing the natural resources for multiple use, sustained yield, and biological integrity. Per OPNAVINST 5090.1E (Navy 2019a), and M-5090.1, NRMs are encouraged to use GIS to support management actions of their INRMP, and thus all data layers with a spatial component are provided in a GIS-compatible format. To make use of this real-time technology and the benefits it offers, NRMs must receive training on this integrated system to fully implement a proactive NRP that supports the military mission and ecosystem integrity. Adequate training in data collection using global positioning system technology is another essential aspect of building and maintaining an up-to-date GIS database for the Installation that meets natural resources planning needs.

The CNRMA's GeoReadiness Center 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 NAVFAC Mid-Atlantic Asset Management Business Line. The GeoReadiness Center 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.

Geographic data and information are an integral part of natural resources and environmental protection and planning at NSAHR. The NAVFAC Mid-Atlantic Core Environmental Business Line (EVBL) provides an Environmental GIS Coordinator to be the liaison between the GeoReadiness Center and all environmental programs within NAVFAC Mid-Atlantic. The EVBL GIS coordinator works with the Subject Matter Experts of the various environmental programs to ensure that their data (developed in-house or via contract) meets current Navy Spatial Data Standards for Facilities, Infrastructure, and Environment Module requirements before it is submitted to the GeoReadiness Center. The EVBL GIS Coordinator also can provide additional GIS support/services to Installation environmental programs upon request and available funding.

Baseline data layers used to develop the figures for this INRMP include, but are not limited to:

- Installation boundary and site details
- Installation training facilities
- Topography
- Soils

- Aquatic resources
- Flood zones
- Ecological communities
- Rare, threatened, and endangered species and their habitats
- Regional environmentally sensitive resources
- Bluebird box locations
- Prescribed burn units
- Hunting compartments
- Invasive and nonnative plant locations
- ERP sites
- Natural resources management units

GIS data, including the environmental layers used for the development of this INRMP, can be accessed through the portal at: https://agp.navfac.navy.mil/arcgis/apps/webappviewer/index.html?id=08bb0baef17e4328a31c8d7c0573df5e. 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.

Map Figures

The Commander, Navy Region Mid-Atlantic's GeoReadiness Center 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 Naval Facilities Engineering Command Mid-Atlantic geographic information systems (GIS) Division. The GeoReadiness Center 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 NSAHR NWA, 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.

The map figures presented in the INRMP are based on Navy and publicly available data, and mostly include base imagery with true color 0.3m resolution satellite imagery from ESRI World Imagery (Sources: ESRI, DigitalGlobe, GeoEye, i-cubed, U.S. Department of Agriculture (USDA), U.S. Geological Survey (USGS), AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community), publicly available at http://goto.arcgisonline.com/maps/World_Imagery. All GIS data created or modified for use in this INRMP will be submitted to the Navy Technical Representative and Installation Natural Resources Manager upon completion of this project.

4.13 Outdoor Recreation

Opportunities for natural resources-based outdoor recreation improve quality of life for Navy personnel, allow close partnership with the local community, and improve knowledge of the natural world and the Navy's stewardship of natural resources. It is Navy policy to provide outdoor educational and recreational opportunities appropriate to the mission and the resources of the installations. Through their INRMPs, installations are encouraged to develop their own programs and cooperate with other groups. NRMs are encouraged to continue the development and enhancement of hunting, fishing, and other outdoor uses of natural resources by the disabled. In addition, the SAIA requires that installations provide public access for use of natural resources to the extent it is appropriate and consistent with the military mission. The primary objectives of outdoor recreation and environmental awareness management at the Installation are to:

- Improve the quality of life for Installation personnel, their dependents, and the military community by providing for outdoor recreational 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 conservation programs.

Recreation opportunities are limited at NSAHR HQ Complex, NSAHR LRA, and NSAHR PA, which include fishing, walking trails, pollinator gardens, and picnic areas. Recreational opportunities at NSAHR NWA include hunting, picnicking, wildlife watching, hiking, jogging, and camping. The MWR Department administers picnicking and camping activities. The NRP manages the hunting and fishing program. Both MWR and the NRP provide management oversight of facilities/programs that provide wildlife viewing/watching opportunities. The NRP also provides regulatory oversight to ensure all individuals recreating are complying with natural, cultural, and other environmental resources laws and regulations. Coordination and cooperation between MWR and NR staff are necessary and required for protection management of natural resources on MWR-administered facilities. NR staff provides assistance on such issues as the prevention of nonpoint source pollution, nuisance wildlife control, tree care, and other aspects of urban forest management.

Appendix G contains materials that can be used for educational outreach to the public with regards to natural resources management at NSAHR, particularly at NSAHR NWA, including pamphlets and brochures about safety hazards such as poisonous plants, venomous snakes, and zoonotic diseases; wildlife compliance; pets; and walking, hunting, fishing, and archery opportunities at Navy installations in Hampton Roads.

4.13.2 Hunting

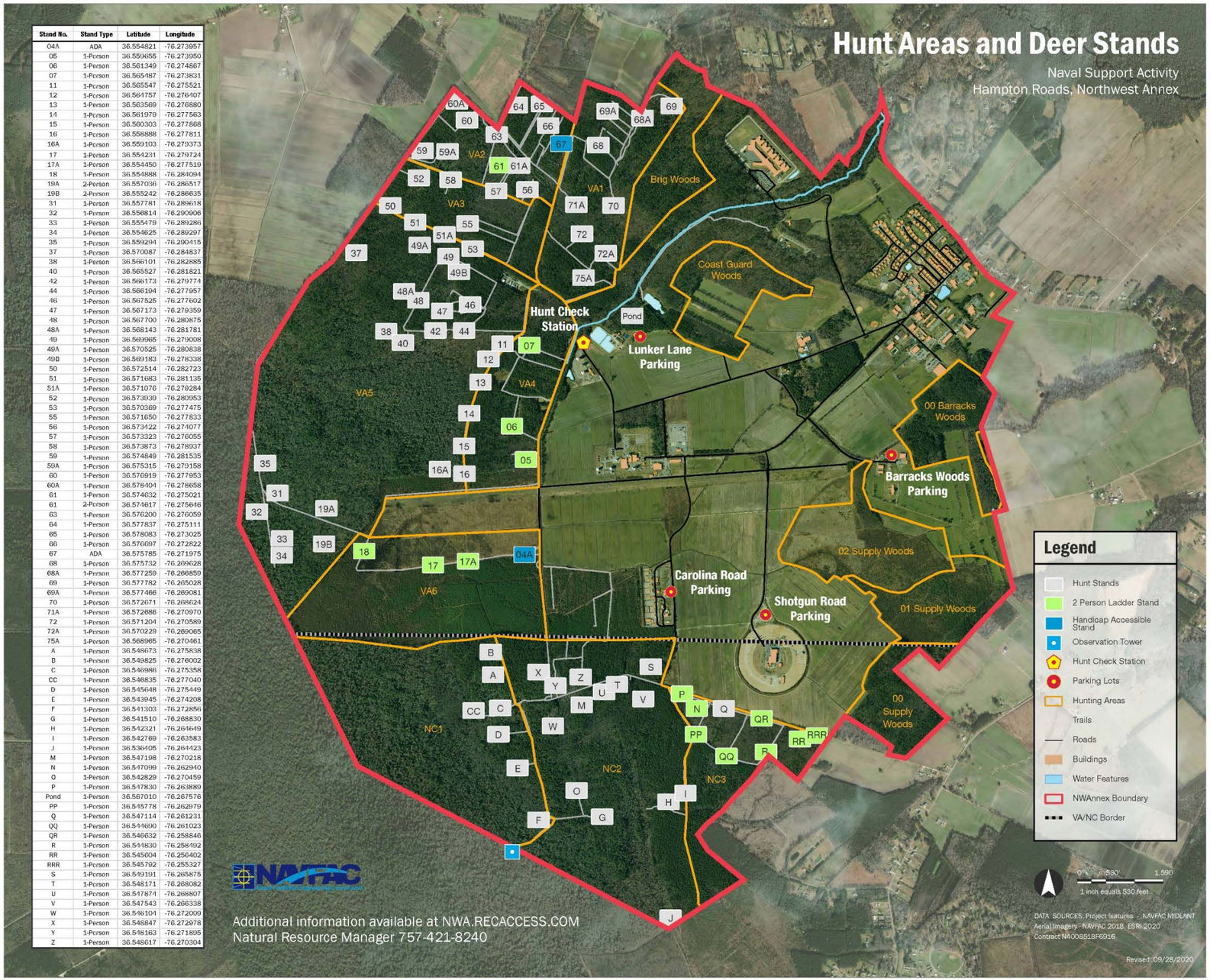
There are no hunting programs at NSAHR HQ Complex, NSAHR LRA, or NSAHR PA. NSAHR NWA has established its own hunting program through implementation of the NSAHR 5090.5 Hunting and Trapping Instruction (Appendix I). The Installation provides opportunities for hunting white-tailed deer and wild turkey. Deer hunting is the most popular sport, with between 100-150 permits sold annually and daily use of NSAHR NWA by 10–30 hunters. In accordance with the SAIA, user fees are used for the protection, conservation, and management of fish and wildlife such as habitat improvement and related activities.

Hunting is generally available to active duty and retired military personnel and their dependents, DoD civilian employees and their dependents, reservist military personnel, and one sponsored guest for each of the aforementioned. However, when heightened force protection conditions exist access may be limited or the hunting program may be suspended altogether. The Installation CO reserves the right to modify access to the Installation based on force protection condition and threat information.

NSAHR NWA hunting is regulated by state law and the NSAHR 5090.5 Hunting and Trapping Instruction. Hunters must obtain appropriate state licenses and Installation permits in order to hunt on the Installation. NSAHR NWA adheres to state game seasons and harvest limits. A hunting notice is released prior to hunting season each year with information regarding each state's seasons and harvest limits (Appendix I). Safety is a primary management issue in the hunting program. All firearm users must demonstrate weapons utilization competency by completing weapons qualifications administered by the NRP, show proof of completion of a state-certified hunter safety course, and complete hunter indoctrination. In addition, all bowhunters must demonstrate competence through a qualification test with NR staff. MWR personnel coordinate campground and trail use with hunting activity to ensure user safety during the hunting season. Use of trails at NSAHR NWA is prohibited for jogging and hiking on designated hunting days during the hunting season.

Hunting is permitted throughout the undeveloped portions of NSAHR NWA (Figure 4-5). NR staff and volunteers maintain 113 permanent tree stands. Eighty-two (82) tree stands are on the Virginia portion of the Installation and 31 are on the North Carolina portion of the Installation. Two of the stands, 67 and 4A, are handicapped accessible. In addition to these stands, hunters are permitted to use personal, temporary tree stands. Barracks Woods, Coast Guard Woods and Supply Woods (00, 01, and 02) are designated only as bowhunting areas, whereas bowhunting, black powder, and shotgun are permitted in the remaining hunting areas. Much of the labor involved in trail access and tree stand maintenance is provided by volunteers associated with the Sportsman Quality Management Board and the NRP.

Law enforcement is solely the responsibility of the Navy; however, Navy enforcement personnel cooperate with state and federal game wardens, as needed, to enforce state and federal wildlife laws. Regional Conservation Officers are required to be trained in law enforcement and state and federal wildlife regulations and must attend annual wildlife law enforcement refresher training in order to stay current on changes in regulations and enforcement policies.



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05	1-Person	36.559655	-76.273950
06	1-Person	36.561349	-76.274867
07	1-Person	36.565187	-76.273831
11	1-Person	36.565547	-76.275521
12	1-Person	36.564757	-76.276107
13	1-Person	36.563569	-76.276880
14	1-Person	36.561979	-76.277563
15	1-Person	36.560303	-76.277868
16	1-Person	36.558888	-76.277811
16A	1-Person	36.559103	-76.279373
17	1-Person	36.554231	-76.279724
17A	1-Person	36.554450	-76.277519
18	1-Person	36.554888	-76.284094
19A	2-Person	36.557036	-76.286517
19B	2-Person	36.555242	-76.286635
31	1-Person	36.557781	-76.289618
32	1-Person	36.556814	-76.290906
33	1-Person	36.555479	-76.289286
34	1-Person	36.554625	-76.289297
35	1-Person	36.559291	-76.290415
37	1-Person	36.570087	-76.284837
38	1-Person	36.566101	-76.282885
40	1-Person	36.565527	-76.281821
42	1-Person	36.566173	-76.279774
44	1-Person	36.566194	-76.277957
46	1-Person	36.567525	-76.277602
47	1-Person	36.567173	-76.279359
48	1-Person	36.567700	-76.280875
48A	1-Person	36.568143	-76.281781
49	1-Person	36.569365	-76.279009
49A	1-Person	36.570525	-76.280838
49B	1-Person	36.569183	-76.278338
50	1-Person	36.572514	-76.282723
51	1-Person	36.571683	-76.281135
51A	1-Person	36.571076	-76.279284
52	1-Person	36.573939	-76.280953
53	1-Person	36.570369	-76.277475
55	1-Person	36.571650	-76.277833
56	1-Person	36.573122	-76.274077
57	1-Person	36.573323	-76.276055
58	1-Person	36.573873	-76.278937
59	1-Person	36.574849	-76.281535
59A	1-Person	36.575315	-76.279158
60	1-Person	36.576919	-76.277953
60A	1-Person	36.578401	-76.278658
61	1-Person	36.574632	-76.275021
61	2-Person	36.574617	-76.275846
63	1-Person	36.576200	-76.276059
64	1-Person	36.577837	-76.275111
65	1-Person	36.578083	-76.273025
66	1-Person	36.576697	-76.272822
67	ADA	36.575785	-76.271975
68	1-Person	36.575732	-76.269628
68A	1-Person	36.577259	-76.268859
69	1-Person	36.577782	-76.265028
69A	1-Person	36.577468	-76.269081
70	1-Person	36.572671	-76.268624
71A	1-Person	36.572686	-76.270970
72	1-Person	36.571204	-76.270589
72A	1-Person	36.570229	-76.269065
75A	1-Person	36.568965	-76.270461
A	1-Person	36.548673	-76.275838
B	1-Person	36.549825	-76.276002
C	1-Person	36.546986	-76.275358
CC	1-Person	36.546835	-76.277040
D	1-Person	36.545648	-76.275449
E	1-Person	36.543945	-76.274208
F	1-Person	36.541303	-76.272856
G	1-Person	36.541510	-76.268830
H	1-Person	36.542321	-76.264649
I	1-Person	36.542769	-76.263583
J	1-Person	36.536405	-76.264423
M	1-Person	36.547198	-76.270218
N	1-Person	36.547099	-76.262940
O	1-Person	36.542829	-76.270459
P	1-Person	36.547830	-76.263889
Pond	1-Person	36.567010	-76.267576
PP	1-Person	36.545778	-76.262979
Q	1-Person	36.547114	-76.261231
QQ	1-Person	36.544690	-76.261023
QR	1-Person	36.546632	-76.258846
R	1-Person	36.544830	-76.258492
RR	1-Person	36.545604	-76.256402
RRR	1-Person	36.545792	-76.255327
S	1-Person	36.549191	-76.265875
T	1-Person	36.548171	-76.268082
U	1-Person	36.547870	-76.268807
V	1-Person	36.547543	-76.266338
W	1-Person	36.546104	-76.272009
X	1-Person	36.548847	-76.272978
Y	1-Person	36.548163	-76.271895
Z	1-Person	36.548617	-76.270304

Figure 4-5. Hunting Areas and Deer Stands within NSAHR NWA.

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The NSAHR NWA hunting program is a dynamic program, and hunting areas can be closed or opened as dictated by military mission and wildlife population management requirements. The type of hunting allowed in a hunting area also may be changed for safety reasons, or to enhance wildlife population control. Changes that are made prior to the hunting season are reflected in hunting instruction, map updates, hunter indoctrination training classes, and NAVFAC Mid-Atlantic environmental and CNIC website. Changes made during the hunting season are posted at the hunter Game Check Station and Rec Access website. The NRP is considering conversion of the Hunting Program from a stand-based program to a hunting area-based program. Established stands are fixed in location, which means hunting and associated wildlife population management via hunting is fixed in location as well. Conversion to a hunting area-based program would reduce maintenance costs and labor needs associated with stand maintenance, and the need to conduct annual safety checks. However, conversion of the program will require site approval, approval by the NSAHR NWA CO, and time and resources to identify hunting areas needed to complete conversion of the program.

4.13.3 Fishing

The NSAHR 5090.4 Fishing Instruction allows fishing at NSAHR NWA and NSAHR PA, and provides fishing regulations (Appendix I). Fishing is allowed to active and retired military personnel, their dependents, active and retired federal civil service employees, and up to two guests for any authorized patron. Regulations prohibit cast nets and trot lines and allow only hook and line and rod and reel methods. Live fish or the release of any species into NSAHR NWA ponds is prohibited, and only catch and release is allowed at NSAHR NWA ponds. Littering and consuming alcohol while fishing at NSAHR NWA and NSAHR PA is prohibited, as well as launching boats from any NSAHR properties. Installation COs or NRMs may close fishing areas at any time. Section 4.4.3 provides additional information on methods to continue to develop the fishing program at NSAHR.

4.14 Bird Aircraft Strike Hazard

In an effort to provide the safest flying conditions possible, DoD continually implements and improves aviation safety programs. BASH prevention program reduces the risk of bird and wildlife strikes through the Operational Risk Management (ORM) process by facilitating personnel from air operations, aviation safety, and natural resources to work together. NSAHR PA and NSAHR NWA currently implement BASH prevention programs.

4.15 Wildland Fire Management

Prescribed fire is a management tool that has a variety of applications in natural resources management. Most commonly, prescribed fire is used to:

- reduce hazardous fuel accumulation;
- prepare harvested sites for seeding and planting;
- maintain early successional habitat;
- improve wildlife habitat; and
- control undesirable vegetation.

At NSAHR, prescribed burning has primarily been used for maintaining vegetation below height restrictions in the ROTHR antenna clear zone and maintaining areas in early successional habitat within NSAHR NWA. There is no prescribed fire management within NSAHR HQ Complex, NSAHR LRA, or NSAHR PA since lands within these properties are mostly developed. Site preparation for tree planting, control of hardwoods in managed pine stands, and habitat improvement are other potential uses that may benefit natural resources management. The prescribe burn program also includes control of invasive species and fire fuel load reduction targets, such as through removal of dead top common reed (*Phragmites australis*) to make herbicide applications more effective, and to reduce fire fuel loading. Controlled burning is conducted according to an approved Wildlife Fire Management Plan (Tetra Tech and Carolina Silvics 2017b), which includes smoke management guidelines and conforms to the NAVFAC Mid-Atlantic Clean Air Act Compliance Guide (Navy 2017). OPNAVINST 5090.1E also provides information on the Navy Guide for Compliance with Clean Air Act General Conformity Rule of 2013. The Wildland Fire Management Plan for NSAHR NWA is included in Appendix H, and prescribed burn units at NSAHR NWA are shown in Figure 4-6. New prescribed burn units are currently available at NSAHR NWA and the plan is currently being finalized. The VDWR recommends consideration of expanding the fire season through Summer, when practicable, and following best management practices to minimize impacts to northern long-eared bats during the summer pupping season. Although concerns related to ground-nesting birds exist, recent research indicates that fire can be used during the growing season to produce beneficial results with few impacts upon birds (Amy Martin Ewin, personal communication).

Prescribed fire can be harmful as well as beneficial and should only be conducted by trained and experienced personnel. Proper diagnosis of fire conditions and detailed planning are needed each time a burn is conducted. Impact to resources should be considered, including wildlife, protected species and habitats, forest cover type, riparian areas, air quality, and aesthetics. Timing prescribed burns to avoid adversely affecting the timber (canebrake) rattlesnake Coastal Plain population and Dismal Swamp southeastern shrew is particularly important. The burn season at the Installation generally extends from late October through mid-April, though most prescribed burning occurs from February to April. To protect ground-nesting bird species, controlled burns should not occur during the breeding season, which is mid-April through late July, although courting and nest construction begins earlier than traditional time frames during warm years and has been documented occurring as early as late February.

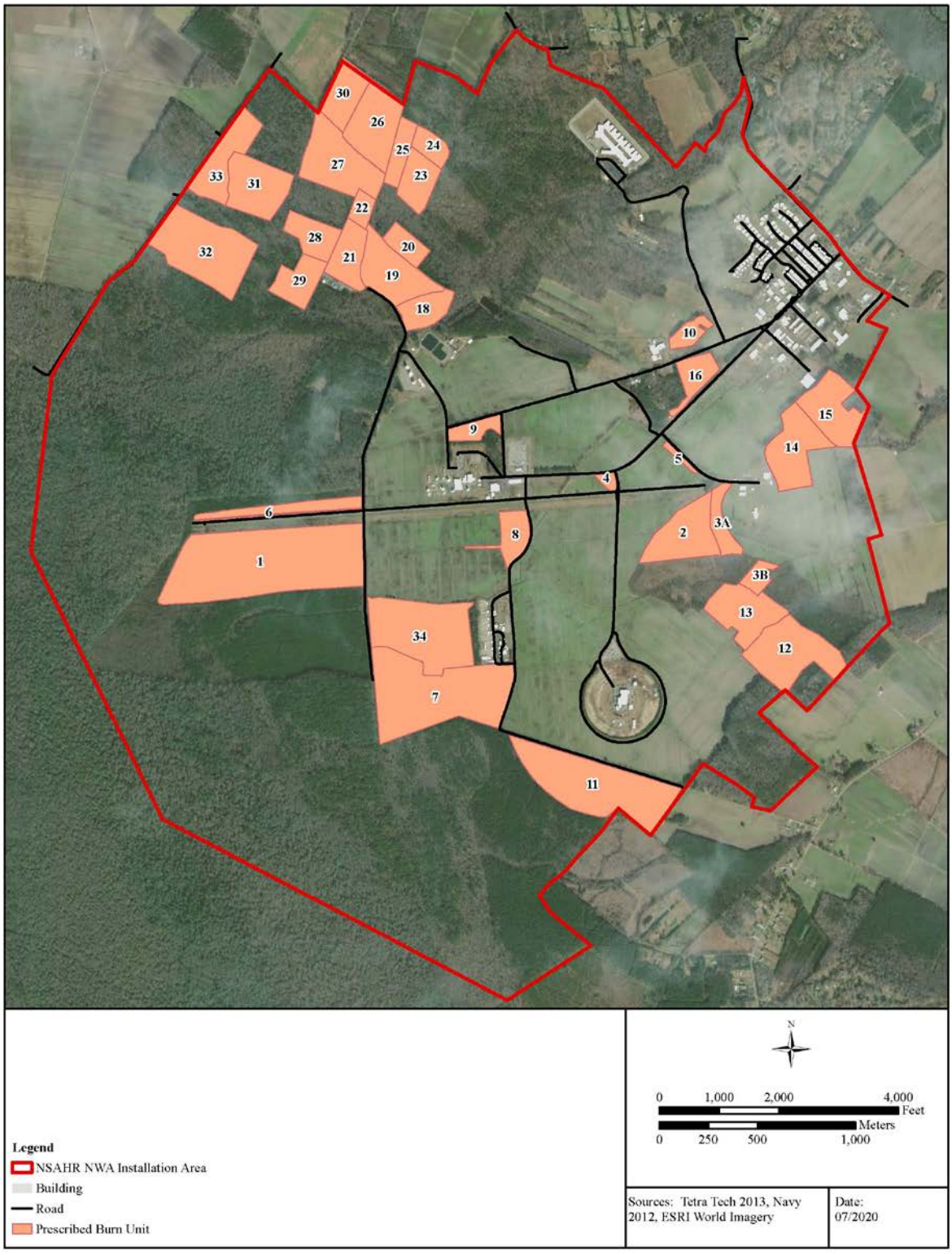

Figure 4-6. Prescribed Burn Units of NSAHR NWA.

4.16 Training of Natural Resource Personnel

The SAIA states "Section 107 of the Sikes Act (16 USC 670e-2) requires sufficient numbers of professionally trained NR 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 resources management plans." The effectiveness of this INRMP is greatly enhanced by the professional development of natural resources management staff. Professional development of staff requires maintaining 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 Engineer Corps Officers School, the Shipley Group, USFWS (National Conservation Training Center), U.S. Army Corps of Engineers (USACE), Wetlands Training Institute, Inc., various university programs, Defense Environmental Network and Information Exchange, and other training centers or vendors as the need arises or training becomes available. Table 4-5 lists contact information for available training.

Table 4-5. Natural Resources Training Opportunities.

United States (U.S.) Government, U.S. Department of Defense (DoD)
Defense Environmental Network and Information Exchange Training and Education Website: https://www.denix.osd.mil/iseerb-courses/home/
Navy Civil Engineer Corps Officers School Environmental Training Program 3502 Goodspeed Street, Suite 1 Port Hueneme, CA 93043-4336 Tel: 805-982-1862 DSN: 551-1862 Fax: 805-982-2918 Website: https://www.public.navy.mil/netc/centers/csfe/cecos/Default.aspx
Armed Forces Pest Management Board Training and Certification Website: https://www.acq.osd.mil/eie/afpmb/training_courses.html
U.S. Army Corps of Engineers Training and Career Development Website: https://www.usace.army.mil/Careers/EEO/Training.aspx
U.S. Government, non-DoD
U.S. Fish and Wildlife Service National Conservation Training Center 698 Conservation Way Shepherdstown, WV 25443-4024 Division of Training Tel: 304-876-7472

Table 4-5. Natural Resources Training Opportunities, Cont.

U.S. Government, non-DoD, Cont.
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-Governmental Organizations (NGOs)
Wetland Training Institute, Inc. Wetland Training Institute, Inc. P.O. Box 351 Stevens Point, WI 54481-0351 Tel: 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 Grainger Hall 9 Circuit Drive, Box 90328 Durham, NC 27708-0328 Website: https://nicholas.duke.edu/about/locations-facilities
University of Wisconsin–Madison Gaylord Nelson Institute for Environmental Studies 70 Science Hall, 550 North Park Street Madison, WI 53706-1491 Tel: 608-262-7996 Website: http://www.nelson.wisc.edu/

NR staff keep current on natural resources issues by attending annual workshops or conferences held by various professional societies. Organizations 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 area's natural history.

The Federal Law Enforcement Training Center provides training for conservation law enforcement officers (CLEOs). Basic training requirements for a federally certified CLEO are identified in the DoD Conservation Law Enforcement Program Instructions (DoD Instructions 5525.17) and are provided through the Federal Law Enforcement Training Center Land Management Police Training Program. Additional training opportunities include, but are not limited to, the following:

- NEC 9545 Navy Law Enforcement Specialist Phase I (Base Police Law-enforcement training);
- NEC 9545 Navy Law Enforcement Specialist Phase II (Command Specific Law-enforcement training;
- NEC 9575 Correctional Custody Specialist Ashore;
- Migratory Bird Treaty Act (MBTA) training, Sikes Act Training, ESA training;
- NMFWA Conservation Officer Refresher Training; and
- Weapons qualifications biannually with the Navy Security department.

A Navy Environmental Readiness Training Program (NERTP) Steering Committee manages a process to identify unmet environmental readiness training needs, validate the needs, and recommend whether NERTP training should be made available. In addition, it defines the environmental readiness training requirements, recommends priorities for dedicated environmental readiness training courses, assesses the effectiveness and efficiency of the training, and identifies and recommends actions to resolve training issues. This committee is chaired by OPNAV N45 and comprises representatives from budget submitting offices (BSO), the Naval Civil Engineer Corps Officers School (CECOS), the Naval Safety and Environmental Training Center (NAVSAFENVTRACEN), and others as invited by the chair. At its discretion, the NERTP Steering Committee may appoint working groups to address specific issues.

A list of core competencies has been developed by the NAVFAC Mid-Atlantic Training Program Coordinator to ensure NR personnel are adequately trained in natural resources management practices, and these are described in the NAVFAC Environmental Community Management Plan. There are four phases of core competencies. Phase I training is required for new media managers, Phase II training is appropriate for existing media managers, Phase III training is required for personnel conducting compliance activities, including inspections at NSAHR, and Phase IV training is required for general storefront compliance.

A list of required and recommended courses and training opportunities follows. A course identification number (CIN) is given for Navy environmental courses. Other information given includes locations or course providers. OPNAVINST M-5090.1E provides additional information on environmental readiness training. Table 4-6 summarizes NERTP formal training courses.

Table 4-6. NERTP Formal Training Courses.

CECOS Courses
Advanced Environmental Law (A-4A-0068) Training and Education Audience limited to officers O-1 through O-6, and civilians General Schedule (GS) grades GS-5 through GS-15 whose responsibilities include managing installation and other environmental management programs. Includes installation environmental officers, deputy environmental officers, and program managers (PM) and their staffs in the areas of compliance, training, natural and cultural resources, P2, and installation restoration (IR) who need advanced training in environmental law and policy.
Advanced Historic Preservation Law & Section 106 Compliance (A-4A-0073) Cultural resources managers (CRM), environmental lawyers, and environmental staffs; collateral duty personnel responsible for cultural resources management and compliance with Federal laws and DoD policy); and personnel who are non-cultural resources specialists (civil works managers from U.S. Army Corps of Engineers (USACE), facility planners; range planners, etc.) having a direct or indirect impact on cultural resources during the performance of their duties.
Armed Forces Pest Management Board Training and Certification Website: http://www.afpmb.org/pubs/courses/courses.htm
Advancing an Effective EMS (A-4A-0098) (currently offered in Webinar format) Navy military, civilian, and contractor professionals charged with managing, implementing, and sustaining an installation's or region's EMS. Not only for environmental professionals; includes guidance for senior process owners to understand concepts necessary to ensure continued EMS conformance.
Advanced Environmental Management (A-4A-0063) Military (O-2 and above, E-6 and above, and W-1 and above), and civilian (GS-11 and above) personnel responsible for managing environmental programs at Navy and Marine Corps shore activities or as the major duty at their commands
Basic Environmental Law (A-4A-0058) Environmental planners, engineers, scientists, other environmental specialists, SJAs, and attorneys who need a survey of environmental law and whose duties involve managing installation and other environmental management programs including compliance, natural and cultural resources, P2, and IR.
Ecological Risk Assessment (A-4A-0081) Remedial project managers (RPM), base realignment and closure (BRAC) environmental coordinators (BEC), and engineers in charge (EIC) involved in IR, BRAC, and underground storage tank (UST) programs.
Emergency Planning and Community Right-to-Know Act (EPCRA) and Toxics Release Inventory (TRI) Reporting (A-4A-0082) Military active duty or civil service employees responsible for EPCRA and TRI data gathering or reporting.
Environmental Background Analysis (A-4A-0092) IR program RPMs, remedial technical managers (RTM), BECs, and Navy personnel responsible for Navy hazardous waste (HW) sites.
Environmental Negotiation Workshop (A-4A-0067) Military and civilian personnel in environmental compliance, IR, and natural and cultural resources and planning who are responsible for communicating and negotiating with other environmental professionals, regulators, and public stakeholders regarding environmental matters.

Table 4-6. NERTP Formal Training Courses, Cont.

CECOS Courses, Cont.
Environmental Protection (A-4A-0036) Military and civilian personnel working in environmental and cultural and natural resources programs and others whose jobs require direct knowledge of environmental requirements. Useful to personnel working in environmental protection, compliance, cultural and natural resources programs, including collateral duty and staff assignments; public affairs, safety, facility planning, public works, acquisition, budget, and management staff; and ROICCs.
Environmental Quality Sampling (A-4A-0026) Military, civilian, or contractor personnel who collect or oversee the collection of environmental samples for DoD.
Hazardous Waste Facility Operators (A-493-0076) Personnel working at treatment, storage, and disposal facilities (TSDF), less than 90-day accumulation facilities, and onboard HW trainers.
Hazardous Waste Operations and Emergency Response (HAZWOPER) for Uncontrolled Hazardous Waste Site Workers-Initial 40 HR (A-4A-0075) All personnel assigned to work at or oversee work at uncontrolled HW sites that require initial safety training.
HAZWOPER for Uncontrolled Hazardous Waste Site Workers-Refresher (A-4A-0074) RPMs, ROICCs, and FEAD and other personnel who work at or oversee work at uncontrolled HW sites and who have received the initial 40-hour HAZWOPER training.
Health and Environmental Risk Communication Workshop (A-4A-0072) Military and civilian personnel in environmental compliance, IR, natural and cultural resources, and planning who are responsible for communicating environmental issues associated with environmental risk management, including: RPMs, BECs, base closure team members, IEPDs, technical experts, engineers, scientists, health and safety personnel, natural and cultural resources personnel, environmental planners, public affairs personnel, ICOs and their staff, executive staff, attorneys, and, on a case-by-case basis, sponsored contractors. Also recommended for graphic illustrators; ROICCs; and construction, contracts, law enforcement, and security officer personnel, depending on job-duty assignments.
Human Health Risk Assessment (A-4A-0078) RPMs, BECs, and EICs involved in IR, BRAC, and UST programs.
Integrated EMS and Compliance Auditing (A-4A-0079) Individuals at the installation or regional level who will be engaged actively or semi-actively on an internal assessment team's execution of the Internal Assessment Plan. As prescribed by Navy policy, lead auditors and team members performing internal and external EMS audits, EMS management representatives, and environmental staff responsible for implementation and maintenance of the EMS must complete the CECOS Integrated EMS and Compliance Auditing training course. May include, but are not limited to: IEPDs, media managers, major process owners (including energy managers), installation cross-functional team members, and installation EMS managers.
Introduction to Cultural Resources Management Laws & Regulations (A-4A-0070) CRMs, environmental lawyers and environmental staffs; collateral duty personnel responsible for cultural resources management and compliance with Federal laws and DoD policy; and personnel who are non-cultural resources specialists (civil works managers from USACE, facility planners; range planners, etc.), having a direct or indirect impact on cultural resources during the performance of their duties.

Table 4-6. NERTP Formal Training Courses, Cont.

CECOS Courses, Cont.
Introduction to Hazardous Waste Generation and Handling (A-493-0080) Personnel (military or civilian) who generate, package, handle, store, transport, or manage hazardous material (HM) or HW in the performance of their duties.
Munitions Response Site Management (A-4A-0093) RPMs, BECs, and EICs involved in IR, BRAC, and UST programs.
NEPA Application (A-4A-0077) In general, limited to officers O-1 through O-5 and civilians GS-5 through GS-15. Targeted for major claimant staff, weapons acquisition program staff responsible for environmental compliance, environmental professionals at engineering field divisions and shore station activities, natural resources managers, real estate specialists, environmental counsel/SJAs, and CEC officers assigned to environmental billets.
NEPA Navy Executive Overview (A-4A-0076) Executive seminar targeted for senior military (O-3 and above) and civilian personnel (GS-11 and above) including flag officers, base commanders, and their staff, including tenants and PMs. Includes those in executive positions of authority who are responsible for and manage fleet training and operational exercises; major acquisitions programs; BRAC actions; construction projects and real estate actions; research, development, testing, and evaluation; and shore facility operations.
Natural Resources Compliance (A-4A-0087) Personnel who manage natural resources for DoD and the U.S. Coast Guard (USCG) as their primary or collateral duty; environmental and community planners, acquisition personnel, installation commanders, training and operations personnel, range managers, restoration PMs, environmental coordinators, environmental and civil engineers, and other conservation personnel. Contractors performing natural resources duties for the government may attend, subject to being sponsored by an installation or command and approved by headquarters personnel.
Navy Environmental Restoration Program (A-4A-0069) RPMs, BECs, and EICs involved in IR, BRAC, and UST programs.
Optimizing Remedy Selection and the Site Closeout Process (A-4A-0089) Military and civilian personnel responsible for the communication of environmental issues associated with IR and environmental risk management, including RPMs, BECs, base closure team members, IEPDs, technical experts, engineers, scientists, health and safety personnel, natural and cultural resources personnel, environmental planners, public affairs personnel, ICOs and their staff, executive staff, attorneys, and sponsored contractors on a space-available basis. Also recommended for graphic illustrators, construction and contracts personnel, ROICCs, and law enforcement and security officer personnel.
Overseas Hazardous Waste Facility Operations (A-493-0093) Overseas personnel (military or civilian) who manage, generate, package, handle, store, transport, or manage HM/HW in the performance of their duties.
Overseas Hazardous Waste Generator (A-493-0094) Overseas personnel who have completed the Overseas Hazardous Waste Facility Operations course and require annual updates.
Resource Conservation and Recovery Act (RCRA) Hazardous Waste Review (A-493-0081) Generators of HW who accumulate waste for less than 90 days and personnel who have completed the Hazardous Waste Facility Operators course or the Hazardous Waste Generators/Handlers course and require annual updates.

Table 4-6. NERTP Formal Training Courses, Cont.

CECOS Courses, Cont.
Uniform Federal Policy for Quality Assurance Project Plans (UFP QAPP) (A-4A-0095) Personnel who develop, review, implement, or use quality assurance project plans (QAPP) or personnel who must communicate QAPPs.
NAVSAFENVTRACEN Courses
Afloat Environmental Protection Coordinator (AEPC) (A-4J-0021-Classroom)/ (A-4J-0022-Global online) Senior enlisted and officer personnel assigned as AEPCs or environmental compliance officers and afloat staff aboard ships and submarines.
Facility Response Team (FRT) Five Day (A-493-0012) Personnel who are, or may be designated as leaders or members, on the FRT or facility spill management team.
FRT Three Day (A-493-0013) Personnel who are or may be designated as leaders or members on the FRT or facility spill management team.
Hazardous Substance Incident Response Management (HSIRM) (A-493-0077) Civilian and military personnel ashore who may serve as activity emergency response (ER) personnel as well as: fire and police department personnel; environmental engineers, specialists, and technicians; environmental managers and supervisors; safety and occupational health personnel; waste handlers and TSDF personnel, HM minimization center personnel; warehousemen; and laboratory personnel. Shipboard personnel will be granted quotas, as space is available, upon verification of membership on the shipboard spill response team (SRT). All personnel must have at least 12 months from the course date remaining in their job assignments.
HSIRM Refresher (A-493-0083) Personnel who have met the initial training requirements of HAZWOPER regulations and are required to receive refresher training to maintain competencies.
Incident Command System 300 (ICS 300) (A-493-2300) Personnel who have previously taken the ICS 100- and 200-level courses. These are civilian and military personnel who work at or support an Oil Pollution Act of 1990 (OPA 90) facility, who also should be assigned to the Navy on-scene coordinator (NOSC) oil and hazardous substance (OHS) contingency plan or facility response plan (FRP) spill management team or be designated to provide specific support, expertise, or equipment to the NOSC spill management team or facility spill management team. This may include upper management; SRT leaders; public affairs personnel; safety and health personnel; natural resources personnel; environmental personnel; finance and contract personnel; logistics and support personnel; and security, force protection, and emergency management personnel.
Incident Command System 300 (ICS 300) Refresher (A-493-2301) Personnel who have previously taken the ICS 300 course and must receive refresher training to maintain competencies.

Table 4-6. NERTP Formal Training Courses, Cont.

NAVSAFENVTRACEN Courses, Cont.
Oil and Hazardous Substance Spill Response Tabletop Exercise (OHSTTX) (A-493-2501) Personnel who have previously taken the ICS 100, 200, and 300 courses. Critical personnel should be trained in the Incident Action Plan process. Civilian and military personnel who work at or support an OPA 90 facility, who also should be assigned to the NOSC OHS contingency plan or FRP spill management team or be designated to provide specific support, expertise, or equipment to the NOSC spill management team or facility spill management team. May include upper management; SRT leaders; public affairs personnel; safety and health personnel; natural resources personnel; environmental personnel; finance and contract personnel; logistics and support personnel; and security, force protection, and emergency management personnel.
Non-Navy ISEERB Courses
Advanced Air Quality Management (AFIT) (WENV-532) Installation or command air PMs, primary air program support personnel, attorneys with environmental responsibilities, environmental flight chiefs, environmental compliance chiefs, RECs, and regional environmental officers.
Air Quality Management (AFIT) (WENV 531) Personnel who work in air compliance, whether at the regional or facility level.
Buying Green: A Multifunctional Approach to P2 (DLA) (DCPSO00R750) Employees of DoD and other Federal employees in the contracting, procurement, project planning, or credit-card-holder community. This includes employees responsible for the purchasing or writing specifications to purchase items that can be made with recovered materials, hazardous or toxic materials, ozone-depleting substances, energy-efficient components, or items that use alternative fuels.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/RCRA Process (USACE) (356/33HEL01A) 800-series engineers; environmental protection specialists, PMs, engineering and science, industrial hygienists, chemists, and geologists/hydrologists. Nominees must have at least 1 year of environmental experience. Priority will be given to personnel directly involved in environmental restoration.
Defense Hazardous Materials/Hazardous Waste Handling/Refresher (Army Logistics University) (ALMC-HA/ALMC-DM) Nominees should be military or civilian personnel (or supervisors of personnel) who package, handle, store, transport, and manage HM/HW.
Environmental Laws and Regulations (USACE) (170/CECC-E 33ELRO1A) Personnel assigned environmental duties that require understanding of environmental laws and regulations.
Environmental Sampling Design and Data Quality Assurance (AFIT) (WENV 441) IR program personnel who collect or oversee the collection and analysis of environmental samples from uncontrolled HW sites

Table 4-6. NERTP Formal Training Courses, Cont.

Non-Navy ISEERB Courses
Hazardous Waste Manifest/Department of Transportation (DOT) Certification and Recertification (USACE) (223/CECW-ET/429/CECW-ET) Persons who identify proper shipping names for HW as per DOT regulations; select appropriate packaging, marking, labels and placards; determine RCRA waste identification and classification; complete or review HW manifests and land disposal restriction notifications; prepare shipping documents for HW, used oil, polychlorinated biphenyls, and asbestos; ship analytical samples, load or unload HW; and prepare waste/materials for transport.
On-Scene Coordinator Crisis Management Course (USCG) (OSCCM-MS-523) Unit COs or XOs at O-6/O-5 level with on-scene coordinator responsibility for OHS incidents.
Qualified Recycling Program (QRP) Management (AFIT) (WENV 160) Installation-qualified recycling PMs and installation P2 PMs who manage the QRP. Secondary audience is P2 PMs who supervise QRP managers, environmental flight chiefs, and other recycling program personnel.
Transportation of HM/HW and Transportation of HM/HW Refresher (DLA) (DCPSO00R510/DCPSO0610) Meets the DOT initial and refresher training for personnel who package and transport HM/HW. Focuses on compliance with shippers' responsibilities for surface transportation of HM/HW. Topics include: hazardous property identification and classification, training requirements, ER information, shipping paper (manifest) requirements, packaging, marking, labeling, and placards.
Water Quality Management (AFIT) (WENV 541) All DoD water PMs.
COMNAVFACENGCOM Courses
AICUZ Seminar Personnel involved in naval air station AICUZ programs, including COs, XOs, air operations officers, CPLO, PWOs, public affairs officers, designated AICUZ personnel, planners, natural resources personnel, and safety personnel.

4.17 Coastal/Marine Management

The CZMA encourages states to preserve, protect, and, where possible, restore or enhance valuable coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as fish and wildlife. Virginia's coastal management area includes 29 counties, 17 cities, and 42 incorporated towns, including the City of Chesapeake. Although federal lands are excluded from state coastal zones, activities on federal lands that are reasonably likely to affect use of lands, waters, or natural resources of Virginia's coastal zone must be consistent, to the maximum extent practicable, with the enforceable policies of Virginia's Coastal Resources Management Program. Federal activities affecting Virginia's coastal zone are subject to consistency review by the VDEQ and other Virginia agencies responsible for the Coastal Resources Management Program. Federal activity affecting Virginia's coastal zone must be fully consistent with Virginia's enforceable policies unless other provisions of federal law prohibit full consistency.

An outline of Virginia's federal consistency review process is available on the VDEQ website:
http://www.deq.virginia.gov/Programs/EnvironmentalImpactReview/FederalConsistencyReviews.aspx

Enforceable policies comprising Virginia's Coastal Zone Management Program that apply to NSAHR include:

- **Subaqueous Lands Management** – This program establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the VDEQ, Water Division. The program is administered by the VMRC (Code of Virginia §28.2-1200 through §28.2-1213).
- **Tidal and Non-tidal Wetlands Management** – This program preserves tidal wetlands, prevents their despoliation, and accommodates economic development in a manner consistent with wetlands preservation. The Virginia Water Protection Permit Program administered by the VDEQ includes protection of wetlands, both tidal and non-tidal. This program is authorized by Code of Virginia §62.1-44.15.5 and the Water Quality Certification requirements of Section 401 of the CWA of 1972. The Tidal Wetlands Program is administered by the VMRC (Code of Virginia §28.2-1301 through §28.2-1320).
- **Nonpoint Source Pollution Control** – Virginia's Erosion and Sediment Control Law requires that soil-disturbing projects be designed to reduce soil erosion and decrease inputs of chemical nutrients and sediments to the waters of Virginia. This program is administered by VDCR (Code of Virginia §10.1-560 et seq.), which regulates activities in the Resource Protection Areas within 84 of Virginia's coastal zone localities.
- **Point Source Pollution Control** – The point source program is administered by the State Water Control Board (Code of Virginia §62.1-44.15) and the State Air Pollution Control Board (Code of Virginia §10-1.1300). The Point Source Pollution Control Program regulates discharges into state waters through the Virginia Pollutant Discharge Elimination System (VPDES) and Virginia Pollution Abatement permits, and through implementation of the National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to Section 402 of the CWA.
- **Fisheries Management** – This program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. This program is administered by the VMRC (Code of Virginia §28.2-200 through §28.2-713) and the VDWR (Code of Virginia §29.1-100 through §29.1-570).
- **Shoreline Sanitation** – The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of Virginia. This program is administered by the Department of Health (Code of Virginia §32.1-164 through §32.1-165).

- **Point Source Air Pollution Control** – The VDEQ implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. This program is administered by the State Air Pollution Control Board (Code of Virginia §10-1.1300).
- **Coastal Lands Management –** Coastal Lands Management is a state-local cooperative program administered by VDEQ's Water Division and 84 localities that regulates activities in Chesapeake Bay Resource Management Areas and Resource Protection Areas in Tidewater, Virginia established pursuant to the Chesapeake Bay Preservation Act (Virginia Code § 62.1-44.15:67 through 62.1-44.15:79) and Chesapeake Bay Preservation Area Designation and Management Regulations (Virginia Administrative Code 9 VAC 25-830-10 et seq.)

In North Carolina, the NCDENR, Division of Coastal Management carries out the state's Coastal Area Management Act, which was federally approved in 1978. Federal projects must comply with the key elements of North Carolina's Coastal Area Management Act, which include regulations passed by the Coastal Resources Commission, local land use plans certified by the Coastal Resources Commission (CRC) and a network of other state agency laws and regulations.

The NCDENR, Division of Coastal Management guidance on consistency determinations is available on the NCDENR website:

https://deq.nc.gov/permits-rules/permit-assistance-and-guidance.

As a part of the Coastal Area Management Act, the CRC has designated areas of environmental concern (AECs) within the 20 coastal counties and has set rules for managing development within these areas. There are four categories of AECs, which include:

- The estuarine and ocean system;
- the ocean hazard system;
- public water supplies; and
- natural and cultural resource areas.

Freshwater swamps and inland, non-tidal wetlands are not in the Coastal Area Management Act permit jurisdiction unless the CRC specifically designates them as AECs (NCDENR 2007). However, these wetlands are protected by the federal CWA, and a USACE permit may be required for projects taking place in these wetlands. There are no designated AECs at any properties of NSAHR.

NSAHR must comply with the state Coastal Zone Management requirements of Virginia and/or North Carolina, where applicable. All activities at NSAHR are reviewed for their potential impact to coastal zone resources and their compliance with the state's enforceable policies of the CZMA. The Navy strives to avoid and minimize impacts to coastal zone resources to the extent practicable when conducting activities. All development or other activities that are likely to impact land or water use or natural resources within state coastal management areas (coastal zones) require a coastal consistency determination. Federal lands, the use of which is by law subject solely to the

discretion of or which is held in trust by the federal government, its officers or agents, are excluded from state coastal zone requirements. However, activities on federal lands with any reasonably foreseeable effects to state-designated coastal zone areas must be consistent to the maximum extent practicable with the state's coastal zone management program. NR staff must review plans and proposed actions at the Installation to ensure consistency with the Virginia and North Carolina coastal zone management programs and help obtain a consistency determination when required. Management actions include monitoring non-point source pollution, marine fish and wildlife species and habitat, and wetlands. NSAHR has implemented numerous management practices that benefit the coastal zone environment, including protection of stormwater quality (see Section 4.2.4 Stormwater Quality), erosion and sediment controls (see Section 4.10.2 Erosion and Sediment Control), and riparian buffer restoration (see Section 4.2.3 Watershed Protection). These management techniques directly and indirectly benefit plant and wildlife species, water resources, and habitat that exist in the coastal zone at NSAHR.

All DoD components shall, in a regionally consistent manner and to the extent practicable, and using the best science available:

- utilize existing tools to assess the potential impacts of climate change to natural resources on DoD installations;
- identify significant natural resources that are likely to remain on DoD lands or that may in the future occur on DoD lands; and
- when not in conflict with mission objectives, take steps to implement adaptive management to ensure the long-term sustainability of those resources.

Sea level rise caused by climate change has the potential to affect existing coastal infrastructure critical to the DoD. DoD facilities located in low-lying coastal areas are expected to experience significant changes to environmental resources and man-made infrastructure. DoD's SERDP conducts several vulnerability and impact assessments for coastal installations that are threatened by climate change issues such as rising sea-levels. Project RC-1701, Risk Quantification for Sustaining Coastal Military Installation Assets and Mission Capabilities, examined approaches that can quantify potential impacts to critical infrastructure and mission performance at Naval Air Station Norfolk, Virginia. Project RC-1701 developed an integrated, multi-criteria, multi-hazard risk assessment framework that was used to evaluate changes in risks to coastal military installations and mission capabilities in the Hampton Roads region due to global climate change (SERDP 2017). Although the study was specifically focused on Norfolk Naval Station, the assessment framework helps policymakers and NRMs develop strategies that support mission adaptation and long-term sustainability at DoD installations throughout the Hampton Roads region (SERDP 2017).

Assessing the impacts of climate change is best approached by identifying an environmental baseline for the future that considers the differences in landscape form and function caused by climate change and other stressors on the landscape (Commander, Navy Installations Command [CNIC] 2012). Therefore, NR staff at NSAHR and other DoD installations in the Hampton Roads region should continue to pursue partnerships with SERDP, SALCC, Society for Ecological Restoration International, and other regional conservation partners in an effort to assess impacts

from climate change and develop appropriate adaptation strategies to protect natural resources in the region.

4.18 Floodplain Management

A function of floodplains, especially wetland areas such as estuaries, is their ability to temporarily store floodwaters, trap erosion-generated sediment, and remove nutrients (such as nitrogen and phosphorous), and chemical and organic wastes. The ability of these areas to perform these functions is limited when the floodplain becomes developed. Floodplains receive protection through EO 11988, Floodplain Management, which directs federal agencies to reduce the risk of flood loss by not constructing in floodplains, and to restore and preserve the natural and beneficial values served by floodplains. The principal sources of flooding in the flood zone are from astronomical tides (e.g., lunar tides), storm surge, and seiches (i.e., a standing wave that can be caused by winds, seismic activities, or tsunamis).

Figure 2-11 and 2-12 delineate the 100-year flood zone for all installations at NASHR, as determined by the Federal Emergency Management Agency (FEMA). These areas are subject to inundation during a storm with a magnitude expected to occur once within a 100-year period. Significant portions of NSAHR HQ Complex, NSAHR LRA, and NSAHR PA are within the 100-year flood zone.

The EPA has prepared guidance for siting hazardous waste management facilities in environmentally sensitive areas such as floodplains and wetlands. Section 264.18, Location Standards, of the Resource Conservation and Recovery Act (RCRA) (40 CFR 26418), specifies that a facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless the owner or operator can demonstrate to the EPA regional administrator's satisfaction that (1) procedures are in effect that will cause the waste to be removed safely, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to flood waters; or (2) for existing waste piles, no adverse effects on human health or the environment will result if washout occurs. A washout means the movement of hazardous waste from the active portion of the facility as a result of the flooding.

Flood zones on the installation may change with climate change, in particular with sea-level rise and a superimposed storm surge from extreme storms. Section 2.7.2 Climate Change and Section 3.2 Climate Change provide more details on installation areas that are vulnerable to sea-level rise and storm.

Any dredge or fill activities planned for areas located within the floodplain zone may require coordination with the USACE and may be subject to NEPA review and documentation before any ground-disturbing activities are undertaken in floodplains. Another management action may include analyzing how the flood zone may shift with sea-level rise and assess whether this will affect additional hazardous waste and oil locations.

4.19 Other Leases

There are currently no other leases for any properties within NSAHR.

4.20 Ecosystem Management

Since the early 1990s, federal land managers have increasingly been adopting the concept of ecosystem management. DoD has had an official policy on ecosystem management since 1994 when the Deputy Under Secretary of Defense for Environmental Security issued a memorandum promoting ecosystem management on military installations. DoD Manual 4715.03 further states that natural resources under the stewardship and control of DoD should be managed using ecosystem-based management principles and guidelines that maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine ecosystems, as applicable) ecosystems, while supporting sustainable economies, human use, and the environments required for realistic military training operations (DoD 2018). Adopting ecosystem-based management principles and guidelines has required a shift in focus from ensuring that resource utilization is sustainable, to ensuring that the natural ecosystems themselves are sustained. DoD ecosystem-based management principles and guidelines are incorporated by the following:

- maintaining and improving the sustainability and native biodiversity of ecosystems through preservation of ecosystem function and integrity;
- considering ecological units and timeframes;
- supporting sustainable activities through integration and consideration of human social and economic interests with environmental considerations;
- developing a vision of ecosystem health;
- developing priorities and reconciling conflicts;
- developing coordinated approaches to work with stakeholders to identify management goals for ecosystem health;
- relying on the best science and data available;
- using goals and objectives to monitor and evaluate outcomes;
- using adaptive management to address changing conditions and requirements; and
- implementing activities through existing installation plans and programs.

4.21 Adaptive Management

Ecosystem-based management is best accomplished by using adaptive management techniques. Adaptive management is an iterative cycle of planning, monitoring, evaluation, and adjusting management. Unknown factors and changing conditions require management goals and prescriptions to be adaptable. Periodic reviews of management goals and practices provide the opportunity to incorporate new science and information as well as assess the performance of management actions. Prescribed actions should be considered experimental and subject to change if the expected or desired results are not achieved.

At the installation level, adaptive management includes development of flexible management practices to accommodate the evolving scientific understanding of ecosystems and adjusting management practices as necessary, based on, at a minimum, annual INRMP reviews. Installations also accommodate training and test mission changes and coordinate resultant impacts on existing

ecosystem management to preserve both training/testing and conservation processes and objectives. DoD components of adaptive management include:

- identification and assessment of military mission operations and facility requirements;
- analysis and assessment of risks to natural resources;
- completion of needs assessment surveys;
- monitoring and preparation of the needs assessment results;
- updating of natural resources inventories to ensure information is current;
- reanalysis and reassessment of risks to natural resources; and
- incorporation of adjustments into the overall NRP, as necessary (DoD 2018).

4.22 Cultural Resources

Cultural resources, including archaeological sites, historic structures, buildings, landscapes, objects, and districts are nonrenewable resources that illustrate the historical development of the U.S. federal facilities. As stewards of cultural resources; this responsibility is recognized in the National Historic Preservation Act (NHPA) of 1966 as amended; EO 11593, *Protection and Enhancement of the Cultural Environment* and EO 13287, *Preserve America*; and in numerous other federal laws and regulations, and DoD and Navy policies. Under the NHPA, each federal agency is tasked with the responsibility of establishing a preservation program to identify and evaluate cultural resources that may be eligible for listing on the National Register of Historic Places. Properties under a federal agency's jurisdiction that are listed or eligible for listing on the National Register of Historic Places shall be managed and maintained in a way that considers the preservation of their historic, archaeological, architectural, and cultural values. The cultural resources program at NSAHR is the responsibility NAVFAC Mid-Atlantic (Code EV2) under the Regional Historic Preservation Officer.

A phased survey was being conducted of resources at NSAHR NWA constructed from 1948–1962 to determine if any resources are NRHP-eligible for listing on the National Register of Historic Places (NRHP). Several areas have been identified as potential historic districts that warrant additional evaluation, although no potentially significant properties have been identified. Several resources were identified which were constructed after the study period but may be of interest for later studies, including the ROTHR antenna system and satellite reception, and transmission equipment related to important technological developments during the later years of the Cold War era. A report has been submitted to the Virginia State Historic Preservation Officer (SHPO) for review and concurrence is pending (Sadler & Whitehead Architects, PLC 2012).

4.22.2 Archaeological Surveys

Archaeological surveys at NSAHR HQ Complex have been conducted and results are still pending (Navy 2019h).

Two archaeological surveys have been conducted at NSAHR LRA, resulting in the identification of one archaeological site; however, the site was determined to not be eligible for listing in the NRHP. As of 2019, historic property identification at NSAHR PA is 29% complete.

There have been four total archaeological surveys at NSAHR PA, including two Phase I Identification surveys, one Phase II evaluation study, and one Phase III data recovery of Site 44PM0046, which was determined to be eligible for the NRHP. As of 2019, historic property identification at NSAHR PA is 56% complete.

Numerous archaeological surveys have been conducted at NSAHR NWA between the early 1980s and 2014. The surveys documented include seven Phase I surveys, five Phase II surveys, and one Phase III survey. A total of 54 archaeological sites have been identified at the Installation. Twenty-four of the sites have been determined to be not eligible for inclusion on the NRHP by Virginia SHPO; eleven sites have been determined to be Potentially Eligible; and eleven sites have not been evaluated. Data has been recovered from two sites which were subsequently destroyed, and three sites have been identified as containing human remains and avoidance is recommended. As of 2019, historic property identification at NSAHR PA is 98.6% complete (Navy 2019h).

4.22.3 Historic Buildings and Structures

Architectural surveys were conducted in 1996 at NSAHR HQ Complex. Surveys at U.S. Fleet Forces Command Compound found that the Naval Command Center Historic District appears potentially eligible for listing the NRHP with a period of significance between 1948 and 1962. The district is potentially eligible as the primary command center for the Navy on the east coast during that time period, and for its unique layout with a cohesive and connected configuration that made it the ideal location to be used as a central command complex. None of the resources in the Camp Allen area were determined to be eligible for listing in the NRHP. Sewell's Point Golf Course was determined to have a Preservation Priority Category of 1; however, eligibility under the NRHP is currently under review.

The Lafayette River Historic District within NSAHR LRA has not been listed in or nominated to the NRHP; however, the Navy and VA SHPO have agreed that the historic district meets some National Register Criteria. Eight extant buildings currently contribute to the National Register eligibility of the historic district.

An architectural survey was conducted in 2002 at NSAHR PA and determined that that there are 46 buildings and structures constructed between 1827 and 1997. The Portsmouth Naval Hospital Historic District has not been formally listed under the NRHP; however, the Navy and Virginia SHPO have agreed that the historic district meets some National Register Criteria. Six buildings within the Portsmouth Naval Hospital Historic District were identified as needing Section 106 compliance.

An architectural survey completed in 1996 concluded no architectural resources at NSAHR NWA are eligible for listing on the NRHP but recommended that Installation buildings and structures be re-evaluated when they reached the 50-year criteria (R. Christopher Goodwin & Associates 1997).

NSAHR NWA was not included in the 1999 Programmatic Agreement for Historic Buildings in Hampton Roads between the Navy, Virginia SHPO, and the National Advisory Council on Historic Preservation as it had not been surveyed prior to execution of the Regional Programmatic Agreement. Therefore, in accordance with Section 106 of the NHPA, every action that has the potential to affect resources (e.g., ground-disturbing activities, renovation of buildings, and demolition of buildings) must be coordinated with the Virginia or North Carolina SHPO and other consulting parties as appropriate, prior to implementation.

An ICRMP is required for all DoD facilities per federal and DoD regulations. An ICRMP is a five-year planning document which serves to manage and protect cultural resources under the control of a military installation so that such resources are properly considered and integrated into the facilities decision-making process. The purpose of an ICRMP is to integrate the entirety of the installations' cultural resources program with the ongoing military mission. As such, an ICRMP allows for identification of potential conflicts between the installation's mission and cultural resources, and identifies actions necessary to meet statutory and regulatory requirements. All properties within NSAHR were included in the 2019 regional ICRMP (Navy 2019h), which provides additional information and guidance on cultural resources management.

5.0 INRMP IMPLEMENTATION

5.1 Project Development and Classification

This INRMP is a public document that requires the mutual agreement of NSAHR, USFWS (Regions 4 and 5), VDWR, and NCWRC. 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 5.4 *Funding Sources*. An annual strategy must be adopted for INRMP funding that addresses NSAHR's legal requirements.

5.1.1 Programming and Budgeting 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 EOs, and DoD policies), or which are in direct support of the military mission.
- Class I: Current Compliance. Includes projects and activities needed when an installation is 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; has not met requirements based on applicable federal or state laws, regulations, standards, EOs, 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 out of compliance (deadlines or requirements have been established by applicable laws, regulations, standards, DoD policies, or EOs, 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 out of compliance (deadlines or requirements have been established by applicable laws, regulations, standards, EOs, 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 EO and are not of an immediate nature.

The Navy funding classification of recurring and non-recurring projects consists of the following four Environmental Readiness Levels (ERLs), in accordance with OPNAV M-5090.1 (Navy 2019b). The following descriptions of each ERL are presented in decreasing order of priority, with ERL 4 representing the absolute minimum requirement to achieve compliance and projects/actions having the highest funding priority as must fund compliance projects, and ERL 1 representing investments in environmental leadership and general proactive environmental stewardship.

Environmental Readiness Level 4 (ERL 4):

- supports all actions specifically required by law, regulation or EO (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 and Overseas Environmental Baseline Guidance Document, and
- supports minimum feasible Navy executive agent responsibilities, participation in Office of the Secretary of Defense (OSD) sponsored interdepartmental and interagency efforts, and OSD mandated regional coordination efforts.

Environmental Readiness Level 3 (ERL 3):

- supports all capabilities provided by ERL 4,
- supports existing level of Navy executive agent responsibilities, participation in OSD sponsored interdepartmental and interagency 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 (ERL 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 (ERL 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.

Per OPNAV M-5090.1, all INRMP projects must be entered into the Environmental Readiness Program Requirements Web (EPRWeb) for review and approval by the Budget Submitting Offices and OPNAV (N45) (Navy 2014a).

5.1.2 Project Classification and Implementation Recommendations

The projects described in this INRMP are 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. Must-fund, 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, involved in the development and implementation of INRMPs,
- terms and conditions of BOs issued by USFWS or NOAA-NMFS,
- baseline surveys and monitoring programs to keep INRMPs current,
- biological surveys to determine population status of rare, threatened, or endangered species and sensitive natural communities,
- wetland surveys for planning, monitoring and/or permit applications,
- support of leadership roles or executive agent responsibilities for the Coastal America, Coral Reef Protection, Chesapeake Bay, and Mojave Desert Ecosystem Management Initiative, and
- MOA/MOU commitments.

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 ERL 1 stewardship projects include:

- 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 effort,
- wildlife management efforts,
- developing a stormwater management improvement strategy, and
- creating living shoreline buffer areas to address shoreline erosion.

5.1.3 Project Implementation Schedule

For prioritization and budgeting purposes, actions or projects recommended in this INRMP are provided in Appendix L. The prime legal drivers (as described previously in this section), programming and budgeting classification, cost estimate, potential funding source, and completion schedule are identified for each project. Cost estimates may represent annual expenditures for the NSAHR NR 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 environmental 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 FY.

Primary statutes and regulations identified in the project table include the CWA, SAIA, ESA, NEPA, and MBTA; state conservation laws; Navy and DoD instructions and policies; and presidential EOs.

5.2 Achieving No Net Loss of 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 2006a).

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" of mission capability may be unavoidable to fulfill regulatory requirements other than the Sikes Act, such as complying with a biological opinion under the provisions of the ESA, or from the protection of wetlands under the provisions of the CWA. However, both 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.

5.3 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 USC 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 MOU, and Cooperative Assistance Agreement. Funds appropriated for multiyear agreements during a FY 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 FY, without regard to whether the agreement crosses FYs. Cooperative agreements entered into are subject to the availability of funds.

Assistance from outside agencies is normally provided through individual agency requests and formal cooperative agreements and partnerships, whereas assistance from within the Navy is normally less formal. During the five-year management period of this INRMP, additional cooperative agreements may be implemented. Technical assistance from organizations outside the Navy may include USFWS, NOAA-Fisheries, USDA NRCS, USDA Animal and Plant Health Inspection Service, Wildlife Services (APHIS WS), U.S. Forest Service, VDWR, Virginia Department of Forestry (VDOF), The Nature Conservancy (TNC), and others.

EO 13352, *Facilitation of Cooperative Conservation* (26 August 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.

NSAHR NWA currently has a cooperative agreement in place with Elizabeth City State University with regards to ongoing cooperative ecosystem studies. Additional agreements would be developed as needed.

5.4 Funding Sources

INRMP projects must be validated and entered into the EPRWeb before ERL 3 and 4 projects can be programmed into the system for funding. ERL 1 and 2 projects are not usually funded through the EPRWeb system, and alternate sources of funding should be sought for these projects. EPRWeb project entries should include clear justification of funds being requested so that: (1) natural resource funds are distributed wisely, and (2) funding levels are not threatened by using funds in ways that are inconsistent with funding program rules (Navy 2006a). The primary sources for funding Navy natural resources programs are: O&MN environmental funds, Sikes Act Revenues, Legacy Resource Management Program (Legacy) Funds, Navy Forestry Revenues, Agricultural Outleases, Fish and Wildlife Fees, Recycling Funds, SERDP Funds, and other Non-DoD Funds.

5.4.1 O&MN Environmental Funds

A majority of natural resources projects are funded with O&MN environmental funds, and are primarily restricted to support "must-fund" environmental compliance projects (i.e., Navy ERL 4 projects). O&MN environmental funds are generally not allocated for ERL 1–3 projects. Other limitations for the use of O&MN environmental funds include the following.

- Only the initial procurement, construction, and modification of a facility or project are considered valid environmental funding requirements. The subsequent operation, modification due to mission requirements, maintenance, repair, and eventual replacement is considered a Real Property Maintenance funding requirement, and
- when natural resources requirements are tied to a specific construction project or other action, funds for natural resources requirements should be included in project costs.

O&MN environmental funds are expected to be the primary source of funding for NSAHR INRMP Environmental Compliance (ERL 4) Projects.

5.4.2 Sikes Act Revenues

Sikes Act Revenues include funds received for hunting and fishing permits and fees that are primarily collected as part of installation hunting, fishing or trapping programs. These fees are deposited and used in accordance with the Sikes Act and DoD financial management regulations. The Sikes Act specifies that user fees collected for hunting, fishing or trapping shall be used only on the installation where they are collected, and be used exclusively for fish and wildlife conservation and management at that installation.

5.4.3 The Legacy Resource Management Program

The Legacy Resource Management Program (Legacy) was part of a special Congressional mandated initiative for funding military conservation projects. Although Legacy was originally funded from 1991 to 1996 only, funds for new projects have continued to be available through this program (Navy 2006a). Legacy funds can be used for a variety of conservation projects, such as regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, monitoring and predicting migratory patterns of birds and

animals, and national partnerships and initiatives, such as National Public Lands Day. Requests for Legacy funds should consider the following:

- the availability of Legacy funds is generally uncertain early in the year,
- pre-proposals for Legacy projects are due in March and submitted using the Legacy Tracker Website,
- project proposals are reviewed by the Navy chain of command before being submitted to the DoD Legacy Resource Management Office for final project selection, and
- the Legacy Website provides further guidance on the proposal process and types of projects requested.

Legacy funds should be considered as a potential funding source for NSAHR INRMP Projects.

5.4.4 Navy Forestry Revenues

Forestry Revenues originate from the sale of forest products on Navy lands, and can be used to fund forestry and potentially other natural resources management programs. Forestry revenues are given preference for funding the Annual Navy Forestry Funds and the DoD Forestry Reserve Account. Annual Navy Forestry Funds are used to support commercial forestry operations at installations. Forestry revenues are first used to reimburse commercial forestry expenses, then, as directed by DoD Financial Management Regulation 7000.14-R Volume 11A, 40% of net proceeds for the fiscal year (FY) for NSAHR are distributed to the state in which the installation resides. The state usually uses these funds to support road systems and schools. Once the commercial forestry expenses are reimbursed, and proceeds are distributed among the state counties, any remaining amount is transferred to a holding account known as the DoD Forestry Reserve Account.

Forestry Revenues also can be used to fund the improvement of forested lands; fund unanticipated contingencies associated with administration of forested lands and production of forest products, for which other sources of funds are not available; and natural resources management for implementation of approved plans and agreements. In order for a natural resources project to be eligible for funding from Forestry Revenues it must:

Be specifically included in an approved management plan, such as an INRMP; and provide for:

- fish and wildlife habitat improvements or modifications,
- range rehabilitation where necessary for support of wildlife,
- control of off-road vehicle traffic,
- specific habitat improvement projects and related activities, and
- adequate protection for species of fish, wildlife, and plants considered threatened or endangered.

The amount of funds available through Forestry Revenues varies from year to year. It is important to note that the amount of funds remaining for natural resources management is relatively small, and although installations are not required to have a timber harvesting plan to be eligible for funds

from the DoD Forestry Reserve Account, Reserve Account funds cannot be used for "must fund" environmental compliance projects. DoD Forestry Reserve Account funds are a potential source of funding for NSAHR INRMP Projects that are not classified as Environmental Compliance (ERL 4) projects.

5.4.5 Agricultural Outleases

Agricultural Outleasing funds are collected through the leasing of Navy-owned property for agricultural use. This money is directed back into the NRP and reallocated throughout the Navy by NAVFAC Headquarters. Agricultural Outleasing funds are primarily allocated for agricultural outlease improvements, but also may potentially be used for natural resources management and stewardship projects once the primary objective is met. In addition to projects related to agricultural outleasing, these funds can be used for implementation of INRMP Stewardship Projects. Although funds available through Agricultural Outleasing varies from year to year, this funding source is one of the more consistent sources for implementing INRMP projects that do not have Level 1 requirements. Agricultural Outleasing funds should be considered as a potential funding source for NSAHR INRMP Projects that are not classified as Environmental Compliance (ERL 4) projects.

5.4.6 Recycling Funds

Installations that have a Qualified Recycling Program (QRP) may use their proceeds for some types of natural resources projects. Any proceeds collected as part of the installation QRP must first be used to cover QRP costs, and then up to 50% of the net proceeds can be for pollution abatement, pollution prevention, composting, alternative fueled vehicle infrastructure support, vehicle conversion, energy conversion, or occupational safety and health projects, with first consideration given to projects included in the installation's pollution-prevention plans. Remaining funds may be transferred to the non-appropriated MWR account for approved programs, or retained to cover anticipated future program costs. NSAHR does not currently include a QRP so Recycling Funds are not expected to be used to support any of the natural resources projects recommended in this INRMP.

5.4.7 Strategic Environmental Research and Development and Environmental Security Technology Certification program (SERDP-ESTCP) Funds

SERDP and ESTCP are DoD's corporate environmental research programs developed to constantly improve DoD's environmental performance. These programs promote partnerships and are planned and executed with the Department of Energy and EPA, and with collaboration with academia, industry, military services, and numerous other federal and non-federal organizations (Navy 2006a).

SERDP funds are allocated to environmental and conservation projects through a competitive process. SERDP focuses on cross-Service requirements and pursues solutions to DoD's environmental challenges through the development and application of environmental technologies that reduce the costs, environmental risks, and time required to resolve environmental problems while, at the same time, enhancing and sustaining military readiness. ESTCP's funds are allocated to the identification of innovative and cost-effective technologies and methods that address DoD's

high-priority environmental requirements. Projects conduct formal demonstrations at DoD facilities and sites in operational settings to document and validate improved performance and cost savings.

5.4.8 Non-DoD Funds

Non-DoD Funds, such as those received from grant programs, are available to fund natural resources management projects, such as watershed management and restoration, habitat restoration, and wetland and riparian area restoration. Federally funded grant programs typically require non-federal matching funds; however, installations can partner with other groups for preparing proposals for eligible projects. NSAHR should consider grant funding and partnerships as a potential funding source for INRMP natural resources projects.

5.4.9 Readiness and Environmental Protection Integration (REPI)

The Office of the Secretary of Defense provides REPI's overarching guidance and funding support for DoD efforts to protect missions and installations. Under the Navy, Navy and Marine Corps installations develop an Encroachment Management Program to address compatibility and readiness sustainment. The Encroachment Partnering program is a key component of the overall Encroachment Management Program, providing the tool to implement and authorize REPI funding. The Navy and Marine Corps seek out partners who share a vested long-term interest in properties of mutual interest and who are able to secure funding to participate in the transactions. The Navy and its partners primarily enter into multi-year encroachment protection agreements that identify geographic areas of interest and govern how each party will conduct a transaction using the combination of partner, REPI, and Navy/Marine Corps funds. Under this over-arching multiyear agreement, the partnership executes individual real estate transactions over a period of years. Funds are obligated and maintained in escrow, so as to be available in the subsequent FY and to allow funding to be added every FY based on requirements and availability of funds.

REPI funds should be considered as a potential funding source for development and establishment of conservation easements that support the INRMP goals and objectives, and to comply with the Navy's requirement for no net loss of military training and effectiveness.

5.5 Commitment

This INRMP will require formal adoption by the Regional Commander or Installation CO to ensure commitment for pursuing funding, and to execute all ERL 4 Projects, subject to the availability of funding. Funding of ERL 4 Projects should be pursued within the specific timeframes identified in Appendix L of this INRMP.

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6.0 REFERENCES

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